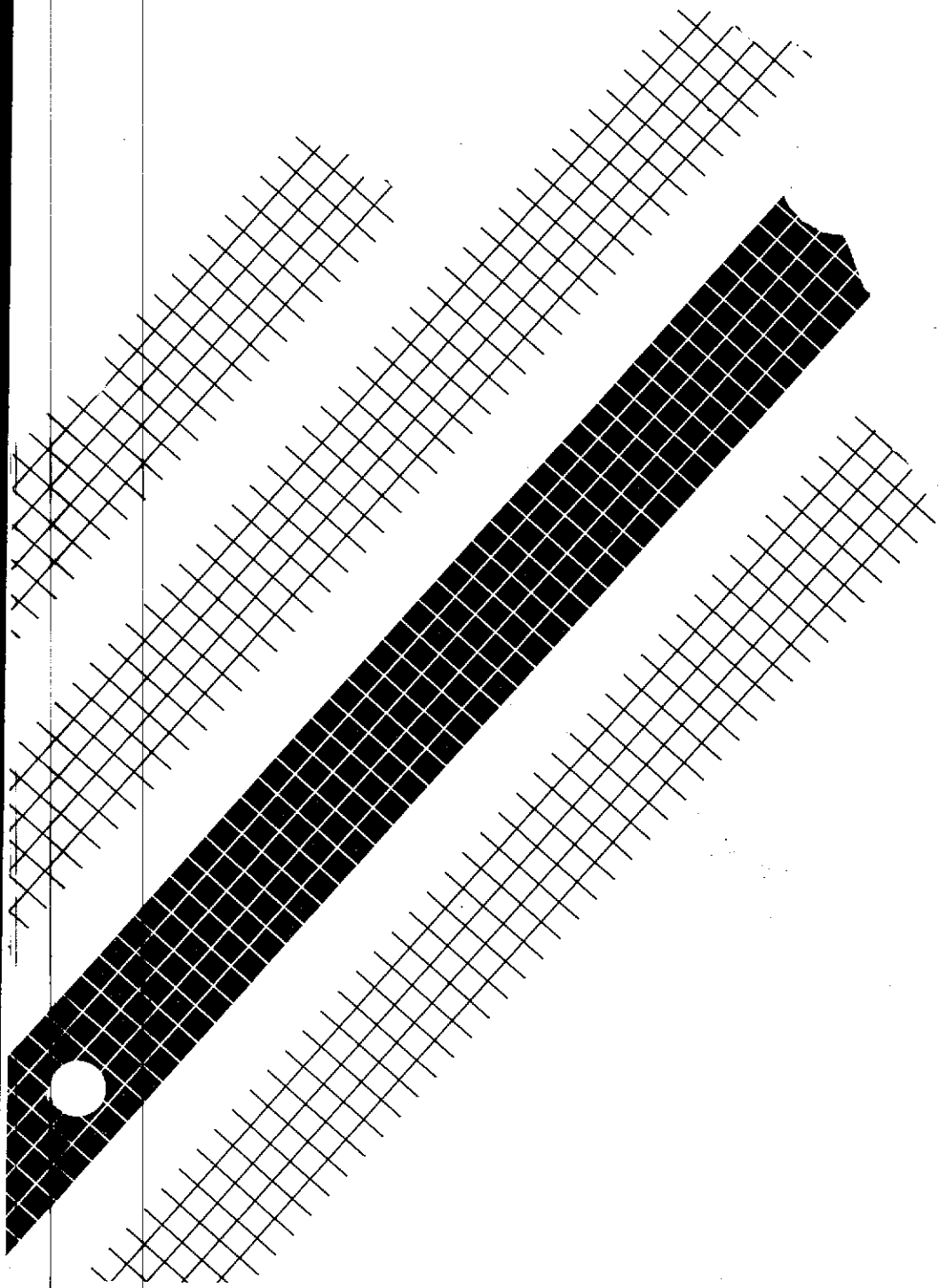
SpaceLabs Medical

The Clinical Information Company



070-0061-02 Rev. B

SERVICE MANUAL

90303B/90311B/90312B PC Bedside/ Central Monitors

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SpaceLabs Medical, Inc.

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- *the electrical installation of the relevant room complies with the requirements of the standard in force, and*
- *the equipment is used in accordance with the operations manual.*

SpaceLabs Medical will make available, on request, such circuit diagrams, component parts lists, description, calibration instructions or other information which will assist appropriately qualified technical personnel to repair those parts of the equipment which are classified by SpaceLabs Medical as field repairable.

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Section 1: Product Description

The PC Bedside (Model 90303B) and/or Central Display Patient Monitors (Model 90311B or Model 90312B) are powerful microcomputers programmed to provide intensive multi-parameter monitoring and data processing capabilities.

Each bedside monitor accepts up to four plug-in patient modules to allow program and patient information processing, waveform, and numeric display. Each bedside monitor can also accept two additional patient modules installed in an optional Remote Module Housing.

Features - Bedside Monitor

- Powerful microcomputer operated by changeable program module and interchangeable patient input modules.
- Large 12-inch screen
- Control keys displayed on touchscreen.
- 5-trace waveform display capability is standard. Other options are 3-trace, 4-trace, and 6-trace waveform display.
- 11 parameter monitoring capability
- Provides 2, 6, 12, or 24 hour trends of monitored parameters (within which any one hour may be expanded).
- Advanced service diagnostic programs
- Alarm Watch and Remote View available for any networked bedside monitor.

Features - PC Central Display

- User configurable screen formats
- Large 12-inch screen
- Control keys displayed on touchscreen.
- Advanced service diagnostic programs
- Provides selection of 2, 6, 12, and 24 hours trends of monitored parameters (within which any one hour may be expanded)
- Alarm Watch available for any networked central monitor.

Inputs and Outputs

Synchronous Data Link Control
The Synchronous Data Link Controller (SDLC) is a two MB per second bi-directional serial bus. The SDLC controls the internal communication: Monitor to Patient Input Module(s); Bedside hot dot chart recorder (optional); Telemetry; and Remote Expansion Housing (optional).

Ethernet
Provides local area network communication to other monitors, system printer or other Ethernet elements.

Serial Port
Connects to standard RS232 devices such as computers, terminals, modems, or printers (optional).

High Level Connector
High level analog signals such as multi-lead ECG with pacer flag and pressures are available from the monitor through this optional connector.

External Alarm
Connects to external alarm, lamps or bell (optional) and/or provides software control of such devices via internal relay.

Keyboard (optional)
Connects to compatible keyboards for PC mode option.

Infrared Remote Control
Allows remote operation of the monitor.

Accessories

Accessories available for the PC Bedside and/or Central Monitors are dependent upon which patient input modules are present in the system. Contact your SpaceLabs Sales Representative or refer to the appropriate patient input module operator manuals to obtain information regarding accessories.

Environmental

Temperature

Storage:	75°C to -40°C (167°F to -40°F)
Operating:	Enclosed = 50°C to 10°C (122°F to 50°F)
	Open = 40°C to 10°C (105°F to 50°F)

Humidity

Storage:	10 to 100% (condensation may occur)
Operating:	10 to 95% (non-condensing)

Shock

No functional damage from edge drop at height of four inches

Altitude

Operating: 0 - 10,000 feet
Storage: 0 - 40,000 feet

Mains Power

Line voltage range: (externally switchable)

74 - 115 VAC	(100 volts nominal)
88 - 135 VAC	(120 volts nominal)
162 - 250 VAC	(220 volts nominal)
176 - 270 VAC	(240 volts nominal)

Frequency

48-62 Hz

Power Consumption

Central Display (without patient input module) consumes 100 - 125 watts typical

Bedside with one multi-lead ECG, two dual pressure and one pressure/ dual temperature module consumes 120 - 160 watts typical

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Note:

Charging an exhausted battery can add up to an additional 12 watts of power consumption.

Leakage

Meets AAMI and UL544 standards for electrical safety

Fuse Ratings
Two 3.0A slo-blo, 250V, for 115VAV nominal operations. Two 1.5A, Type T (time delay) slo-blo for 200-240 VAC nominal operation (rear panel accessible).

Battery Back-up
2.5A/hr 12V sealed lead-acid battery (P/N 384225-002) for memory retention during power outage: 5 minutes minimum with fully charged battery; (typically 10 minutes or longer).

Battery Recharge Time
24 hours during active monitoring (from mains power)

Real Time Clock/Memory/Battery Back-up
3V, 2/3 A/hr lithium battery (P/N 384322-001), located on the CPU board, retains system configuration information. Battery life approximately 5 years.

Physical Dimensions
19.77 in wide x 11.5 in high x 17.0 in deep.
50.2 cm wide x 29.2 high x 43.2 cm deep.

Weight
60 lbs including patient input modules (53 lbs without patient input modules)
27.2 kg including patient input modules (24.0 kg without patient input modules)

Specifications

General

Module Capacity:
Holds up to four patient input modules within monitor housing and up to a total of six when an optional Remote Module Housing is installed. (Bedside Monitor Only)

Parameters:
Supports up to 11 parameters in any combination of patient input modules. (Bedside Monitor Only)

Program Module (ROM-Pack):
Provides for expansion of program power and capabilities.

Display Characteristics Display Type:
Magnetic deflection using a mixture of directed-beam (for waveforms), and vertically scanned raster (for alpha numerics, graphics, and trend plots).

Trace Height:
1.57 in (4.0 cm) dynamic range (non-expanded)
3.15 in (8.0 cm) dynamic range (expanded range)

Trace Lengths:
Bedside: up to five traces, each 6.12 in (15.5 cm), or up to four traces, each 6.12 in (15.5 cm) plus one trace 6.12 in (15.5 cm) or two traces (3.2 in) for arrhythmia class review

Trace Length:
Trends 6.07 in (15.4 cm)

Waveform Accuracy:
5% of range

Sweep Speeds:
Vary by module type. Possibilities are 6.25, 12.5, 25, and 50 mm/sec and freeze. Respiration can go to 1.56 mm/sec.

Trends:
One-minute stored sample resolution for up to 24 hours. Displayed waveform always contains 360 points with resolution as required to span a total time of 2, 6, 12, or 24 hours segments. Data for any one hour within this time span may be selected and expanded.

Overrange:
Waveforms in overrange are identified by dots (clipping) at the area exceeding the range limit. The dots move across the screen in normal or frozen display for real time waveforms, and are stationary for trend waveforms.

Raster Lines:
559, vertically scanned in normal bedside and central displays; 640 vertically scanned in PC Mode displays.

Range of Alphanumeric Character Sizes:
Large - 0.413 x 0.287 in (numeric only); Medium—0.162 x 0.118 in; Small - 0.126 x 0.084 in (widths are 87.5% of these in PC Mode)

Screen Size:
CRT is 12 in (30.48 cm) diagonally. Display area is 6.90 x 9.45 in (17.53 x 24.0 cm)

Phosphor:
P31, short persistence green, aluminized

Touchscreen Type:
Infrared photo transistor/photo detector array with modulated carrier.

Active Area:
7.0 in (17.8 cm) x 10.5 in (26.7 cm)

Number of Elements:
32 on the Y axis at 0.216 in (.548 cm) spacing
24 on the X axis at 0.220 in (.559 cm) spacing

Resolution:
half of the spacing

Microprocessor:
8741/8341

Audio
Programmable pitches are available in 25Hz increments up to 8kHz. Preprogrammed pitches are 1.5kHz ±5%, 1.0kHz ±5% and 250 Hz ±5%.

Processor/Memory

Processors:
Intel 80186 high integration microprocessor, 8744/8344 remote universal programmable interface (RUPI), 8741, and 82586 Ethernet coprocessor.

Memory:
ROM-PACK contains up to 5 banks of 256K each ROM (96K plus two 256K banked switched pages).

- The 670-0477-XX CPU board contains the equivakent of 6 banks of 256 kbytes each, for a total of 1.5M bytes.
- The 308177-XXX CPU board contains the equivalent of 2 banks of 256 kbytes each, with an additional 256 kbyte bank optional

An additional 16 kbytes of battery-backed CMOS RAM and EEROM for retention of critical and SYSGEN data during mains down-time

Optional 256K RAM available for PC Mode operation.

Section 2: Installation and Power-Up Diagnostics

This section contains installation, setup, and maintenance information. A brief discussion of controls and indicators is included to assist in initial setup. To ensure successful network operation, pay careful attention to monitor configuration information.

Unpacking and Removal

Unpacking

Prior to unpacking, inspect the shipping container for visible damage. Document any damage on the shipping invoice and notify the carrier. Unpack and remove the monitor from the shipping container. Check the equipment exterior for signs of physical damage. Notify your SpaceLabs Medical Customer Service Representative (CSR) if damage is apparent.

Interior Inspection

Inspection of the equipment's interior components should be performed by qualified service personnel or by your SpaceLabs Medical CSR.

Note:

This monitor contains circuitry that may be damaged by static electricity. Open only at a static-approved workstation.

To inspect the interior of the monitor, remove the 3 screws on each side of the top cover. Slide the cover to the rear and up.

Inspect for loose connectors or hardware. Reseat and tighten as necessary. Replace the top cover and tighten securely.

Installation

This section describes monitor installation on an existing Ethernet local area network (LAN). The procedure for installing an Ethernet LAN is beyond the scope of this document and should be attempted only by qualified personnel. Contact your SpaceLabs Medical CSR for network installation and information.

The monitor may be installed on a suitable shelf or table. Wall mounts and ceiling mounts are also available from SpaceLabs Medical. The monitor location must allow unobstructed air flow to the front air vent and bottom fan intake located directly below the front panel patient input module inserts. Four threaded mounting inserts are provided on the monitor bottom for bolting to the mounting surface.

To connect the monitor to the Ethernet LAN, first ensure that monitor power is OFF, then attach the LAN transceiver cable to the 15-pin "D" connector on the rear of the monitor. See Figure 2-2, item #4. Tighten the two screws on the cable connector to prevent an accidental cable disconnect.

Note:

The monitor must be properly configured for LAN access prior to monitor operation. Failure to correctly configure the monitor may cause interruption of operation to other units also using the LAN.

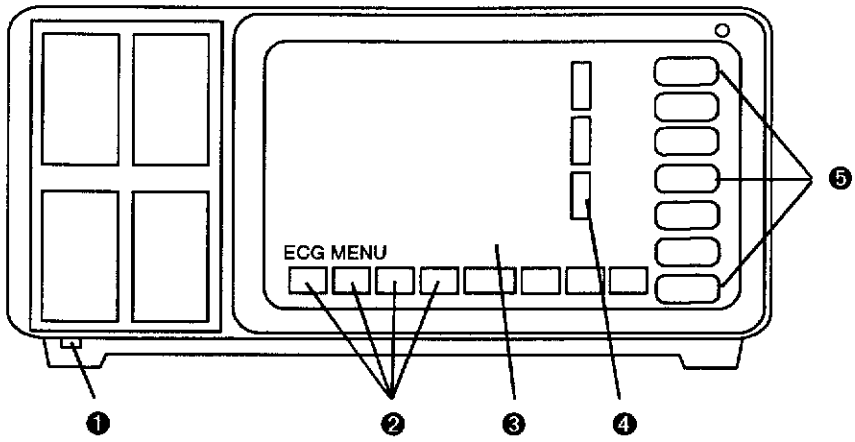
Plug the monitor power cord into a standard AC power source (an emergency power source is recommended).

Controls and Indicators

Monitor operation uses a touchscreen control system. Infrared beams are projected horizontally and vertically across the display screen. Touchscreen keys (termed "soft keys" in this manual) are a function of the module installed in the monitor (ECG, pressure, temperature, etc.). When one or more beams is blocked by a finger or other blunt object, the soft key function that corresponds to that location will be activated.

Those keys located on the monitor to the right of the display (termed "hard keys" or "monitor keys") must be pressed to initiate a monitor function (record, setup, help, etc.).

Front Panel Controls



❶ **Power Switch** - Turns the monitor on and off.

❷ **Menu display area** - The menu selections that appear here vary with the type of patient module inserted into the monitor.

❸ **Message display area** - Help and other system messages appear here.

❹ **Parameter Label keys** - These "soft keys" are generated by installing a patient input module (ECG, RESP, etc.).

❺ These are referred to as "**Hard keys**" or "**Monitor keys**":

HELP - Pressing **HELP** followed by another key will display operator information about the second key's functions.

MONITOR SETUP - Pressing this hard key allows the user to define certain monitor functions, such as the volume of alarm tones, recorder configuration, etc.

SPECIAL FUNCTIONS - Pressing this hard key provides a selection of alarm watch, remote view, trends, and other options.

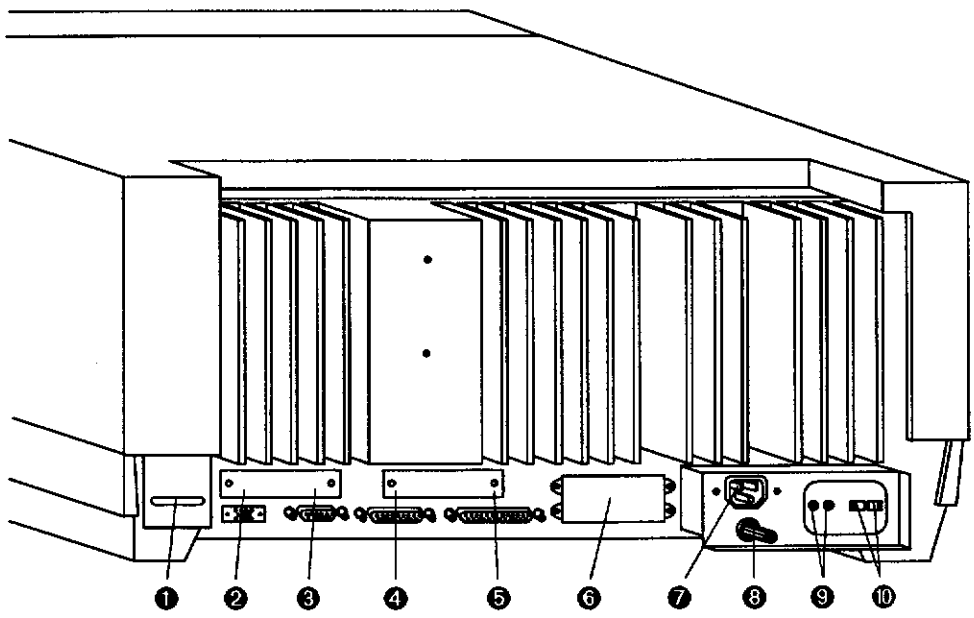
TONE RESET/ALM SUSPEND - Press this hard key once to suspend alarms for approximately 50 seconds. Press twice to suspend alarms for 3 minutes.

RECORD - Initiates a strip chart recording to the recording device.

PREVIOUS MENU - Returns the display to the last menu viewed.

NORMAL SCREEN - Returns the screen to the patient data display and removes all menu keys

Figure 2-2. Rear Panel Connectors



❶ LED viewing slot (see Tables 2-1 and 2-2 for LED diagnostics).

❷ External Alarm Connector - external relay is optional.

❸ External SDLC connection for External Module Housing, Flexports, bedside recorder, etc.

❹ Ethernet connector.

❺ Standard RS232C I/O Port for connection to optional serial devices.

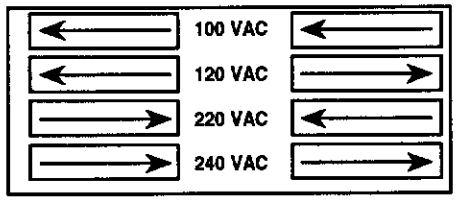
❻ Program Module (ROM-pack) - contains software for mainframe operation.

❼ Power Receptacle - connect to grounded AC mains.

❽ Mainframe Ground - provides a hookup for a secondary ground to minimize ground potential differences between external equipment.

❾ Fuses for AC Mains.

❿ Line voltage selector switches, configurable as shown here:



Power-Up Diagnostics

Table 2-1. Power-Up Diagnostic Sequence

The CPU first performs a power-up sequence that tests the LEDs prior to starting the diagnostic tests.

At the successful completion of these power-up diagnostics, the LEDs begin to indicate task IDs, and the display reverts to normal start-up.

CPU LEDs as seen through the LED viewing slot
(sequentially stepping)

LSB							MSB	Hex	Description
○	○	○	○	○	○	○	○	00	ROM-Pack Checksums
●	○	○	○	○	○	○	○	01	QUICK RAM Test
○	●	○	○	○	○	○	○	02	80186 Instructions
●	●	○	○	○	○	○	○	03	Voltage Test
○	○	●	○	○	○	○	○	04	RAM Bank 1
●	○	●	○	○	○	○	○	05	RAM Common Bank
○	●	●	○	○	○	○	○	06	PC Mode RAM Test
●	●	●	○	○	○	○	○	07	EX 0 RAM Test
○	○	○	●	○	○	○	○	08	EX 1 RAM Test
●	○	○	●	○	○	○	○	09	EX 2 RAM Test
○	●	○	●	○	○	○	○	0A	CMOS RAM
●	●	○	●	○	○	○	○	0B	80186 Timer
○	○	●	●	○	○	○	○	0C	EEROM
●	○	●	●	○	○	○	○	0D	8259 Test
○	●	●	●	○	○	○	○	0E	Clock Test
●	●	●	●	○	○	○	○	0F	(reserved)
○	○	○	○	●	○	○	○	10	DUART Test
●	○	○	○	●	○	○	○	11	Touchscreen Test
○	●	○	○	●	○	○	○	12	Display Test
●	●	○	○	●	○	○	○	13	Ethernet Test
○	○	●	○	●	○	○	○	14	Sound Test
●	○	●	○	●	○	○	○	15	PC Mode RAM Test

○ = LED Off
● = LED On

Test Sequence

00 ROM-Pack Checksums - Each ROM-pack PROM is checked by re-calculating the checksum and comparing it to the stored checksum. PROMs cannot be changed and inserted unless they match the version number of other PROMs in the ROM-pack.

01 QUICK RAM Test - Provides a means of troubleshooting a board with non-operational RAM. If a RAM location fails, this test goes into a continual loop, attempting to write and then read the hexidecimal word AAAA at the failed address.

02 80186 Instructions - Checks some of the 80186 resident instructions for internal problems.

03 Voltage Test - Checks the lithium back-up battery located on the main CPU board and the +5V logic supply.

04 RAM Bank 1 - Bank 1 RAM is filled with a set of patterns and then read to verify that the patterns written remains valid.

05 RAM Common Bank - Common bank RAM is filled with a set of patterns and then read to verify that the pattern written remains valid.

06 PCMODE RAM Test - This test is currently non-functional. PCMODE RAM is tested by Test 15.

07 EX 0 RAM Test - Extra bank 0 RAM is filled with a set of patterns and then read to verify that the pattern written remains valid.

08 EX 1 RAM Test - Extra bank 1 RAM is filled with a set of patterns and then read to verify that the pattern written remains valid.

09 EX 2 RAM Test - Extra bank 2 RAM is filled with a set of patterns and then read to verify that the pattern written remains valid.

0A CMOS RAM - CMOS is checked to determine if it has been initialized. It it has been initialized, the checksum is checked to verify it is still correct. If not, then CMOS is cleared, the initialize flag is set, and the checksum is calculated and stored.

0B 80186 Timer - Checks timer functions present in the 80186. Failures are usually caused by inputs to the 80186 rather than the 80186 itself.

0C EEROM - Performs a checksum in the same manner as used for the CMOS RAM (Test 0A).

0D 8259 Test - Tests the 8259 interrupt controller.

0E Clock Test - Verifies operation of the real-time clock chip.

0F (reserved) - Not currently used.

10 DUART Test - Tests communications with the serial port.

11 **Touchscreen Test** - Checks the infrared touchscreen 8741/8341 processor and each touchscreen sensor under normal and marginal(degraded) settings. If only one beam is broken, then detector/emitter failure is indicated along with the message "Single beam failure - touch both sides for touch analyzer". The display reverts to normal monitor operation within 5 seconds. The monitor and touchscreen will typically remain functional even with a single-beam failure.

If more than 2 beams are broken, then detector/emitter failure is indicated on the screen and the display reverts to the touchscreen analyzer within 5 seconds.

12 **Display Test** - Checks display memory to verify operation and to verify the CPU is communicating with display memory.

13 **Ethernet Test** - Checks the Ethernet 82586 processor to verify that it is communicating with the 80186. A self-diagnostic test is also run.

14 **Sound Test** - Verifies that the sound chip is responding properly to instructions.

15 **PCMODE RAM Test** - The PCMODE RAM is filled with various patterns and then read to verify the patterns.

Table 2-2. Mainframe Diagnostic Test-Failure Codes

The following error descriptions will be displayed if the corresponding error occurs.

If the ROM pack is not properly seated, the LEDs will remain on continuously.

CPU LEDs as seen through the LED viewing slot
(blinking)

LSB							MSB	Hex	Description
●	○	○	○	○	○	○	○	01	PROM U3 Checksum Failed
○	●	○	○	○	○	○	○	02	PROM U7 Checksum Failed
●	●	○	○	○	○	○	○	03	PROM U1 Checksum Failed
○	○	●	○	○	○	○	○	04	PROM U4 Checksum Failed
●	○	●	○	○	○	○	○	05	PROM U2 Checksum failed
○	●	●	○	○	○	○	○	06	PROM U8 Checksum Failed
●	●	●	○	○	○	○	○	07	PROM U6 Checksum Failed
○	○	○	●	○	○	○	○	08	PROM U10 Checksum Failed
●	○	○	●	○	○	○	○	09	PROM U5 Checksum Failed
○	●	○	●	○	○	○	○	0A	PROM U9 Checksum Failed
●	●	○	●	○	○	○	○	0B	Power Fail Interrupt occurred
○	○	●	●	○	○	○	○	0C	80186 CPU Failure
●	○	●	●	○	○	○	○	0D	Battery or 5V Failure
○	●	●	●	○	○	○	○	0E	5V Low
●	●	●	●	○	○	○	○	0F	RAM Parity Error
○	○	○	○	●	○	○	○	10	RAM Pattern Check Failure
○	●	○	○	●	○	○	○	12	CMOS Initialization Failed
●	●	○	○	●	○	○	○	13	RAM Failed Count Test
●	○	●	○	●	○	○	○	15	80186 Onboard Timer Failed
●	●	●	○	●	○	○	○	17	8259 Interrupt Controller Failure
●	○	○	●	●	○	○	○	19	Sound Chip Failure
○	●	○	●	●	○	○	○	1A	Display Controller Failure
●	●	○	●	●	○	○	○	1B	Touch (UPI) Not Responding
○	○	○	○	●	○	○	○	1C	Touch (UPI) Self-Test Failed
●	○	●	●	●	○	○	○	1D	Touch (UPI) Self-Test Failed
○	●	●	●	●	○	○	○	1E	Touch No 29kHz Carrier Detected
●	●	●	●	●	○	○	○	1F	Unknown Interrupt
●	○	○	○	○	●	○	○	21	SDLC Failure
○	●	○	○	○	●	○	○	22	CMOS RAM Failed
●	●	○	○	○	●	○	○	23	EEROM Initialization Failed
○	○	●	○	○	●	○	○	24	Ethernet Failure
●	○	●	○	○	●	○	○	25	(IRTS) Touch Test Failed
○	●	●	○	○	●	○	○	26	EEROM Checksum Failed
○	○	○	●	○	●	○	○	28	Parity NMI Occurred

○ = LED Off
● = LED On

Section 3: Block Diagrams and Troubleshooting

The following discussions are based on a block level approach to the theory of operation, calibration, and troubleshooting. Refer to Appendix A for complete assembly drawings. Refer to Appendix B for assembly part numbers.

System Block

The PC Bedside microprocessor-based patient monitor is capable of driving up to six patient input modules. The monitor has generic data-handling and display characteristics. Module-specific and monitor-specific functions are entirely separate and are software driven.

Patient input modules plug into the module backplane, which can handle four single-high modules (refer to Figure 3-1). Two additional parameter modules can be monitored via a rear panel SDLC connector to the Remote Module Housing.

Patient data is collected and converted into a digital format through the on-board processor in each patient input module and transmitted to the monitor via a synchronous data link control (SDLC) bus.

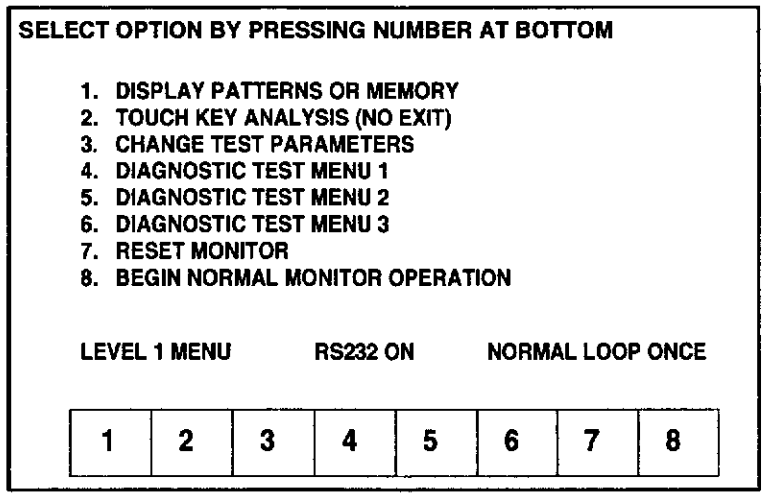
This data is processed by the monitor CPU acting on instructions stored in memory. The main CPU contains on-board dynamic random access memory (DRAM) for temporary storage of data. A removable ROM-pack provides program software and the operating system. User (biomed) and monitor diagnostics are included in all ROM-packs. Refer to the Isolation Diagnostics part of this section for details on operation of user diagnostics. Data is communicated via an Ethernet interface to enable access to other elements on the network.

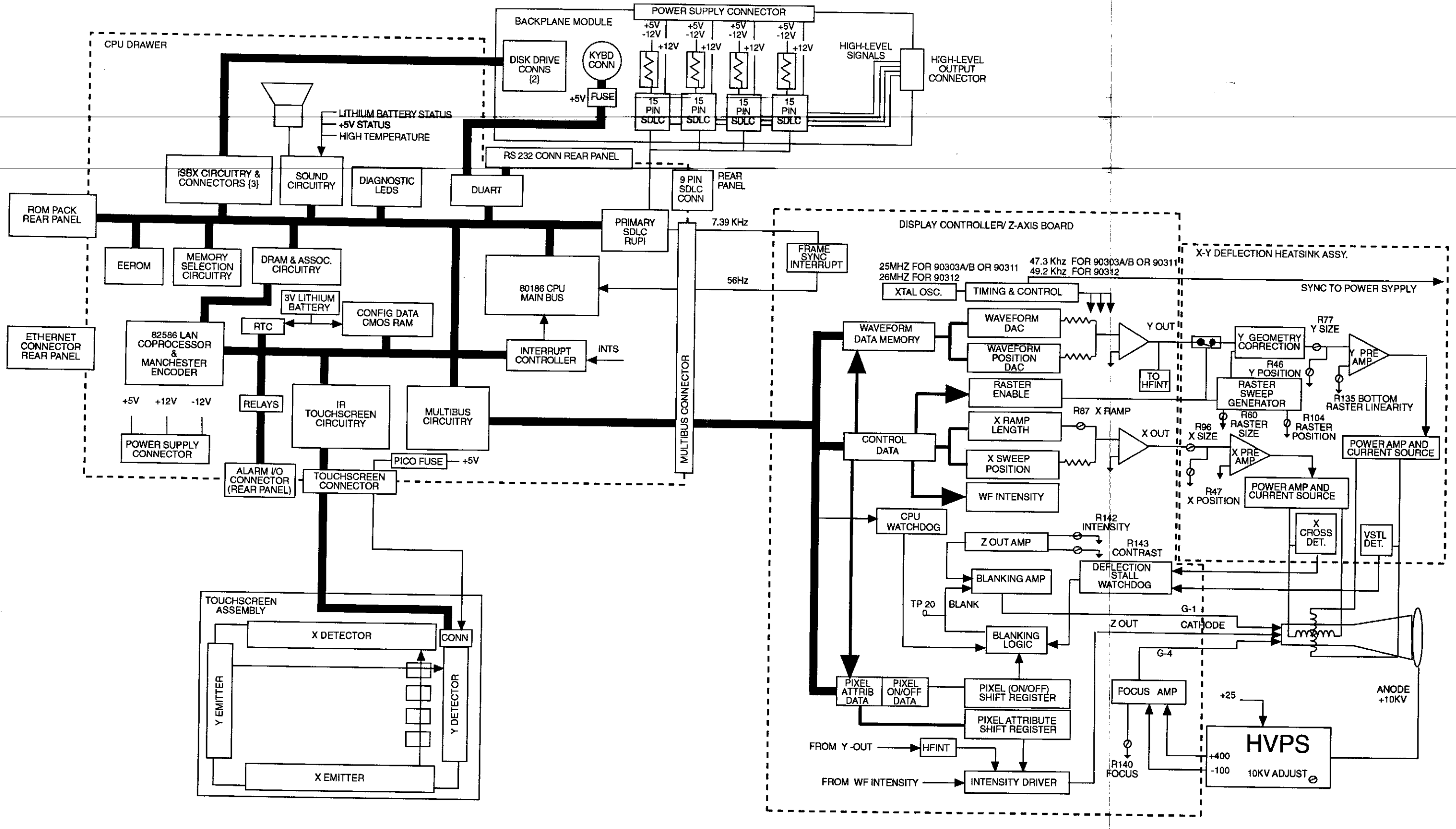
All user controls appear either on the CRT screen as electronically displayed "soft keys" or to the right of the CRT screen as dedicated "hard keys" with printed labels. "Soft keys" and "hard keys" are monitored by the CPU using infrared emitter/detector pairs along the perimeter of the CRT screen. Instructions are initiated when the operator breaks one of the beams on the infrared touch screen (IRTS). Displayed data is sent from the CPU or DRAM via Multi-bus through the Display Controller and the X-Y Deflection Board to the CRT for display.

Power to the monitor is supplied from 120VAC (switchable for international requirements), transformed, and regulated to the DC voltages required by the monitor. Higher voltages required for the CRT are obtained through the high voltage power supply, which receives its +25VDC input voltage from the low voltage power supply.

Isolation Diagnostics

Isolation diagnostics are used for checkout and alignment of various mainframe systems. Initiate isolation diagnostics by placing one finger in each of the lower corners of the touchscreen during power-up. Keep your fingers on the screen while the unit completes power-up diagnostics. At the sound of the beep, which indicates the completion of power-up diagnostics, immediately remove your fingers from the screen corners. The Level 1 diagnostics menu then appears (see the illustration).





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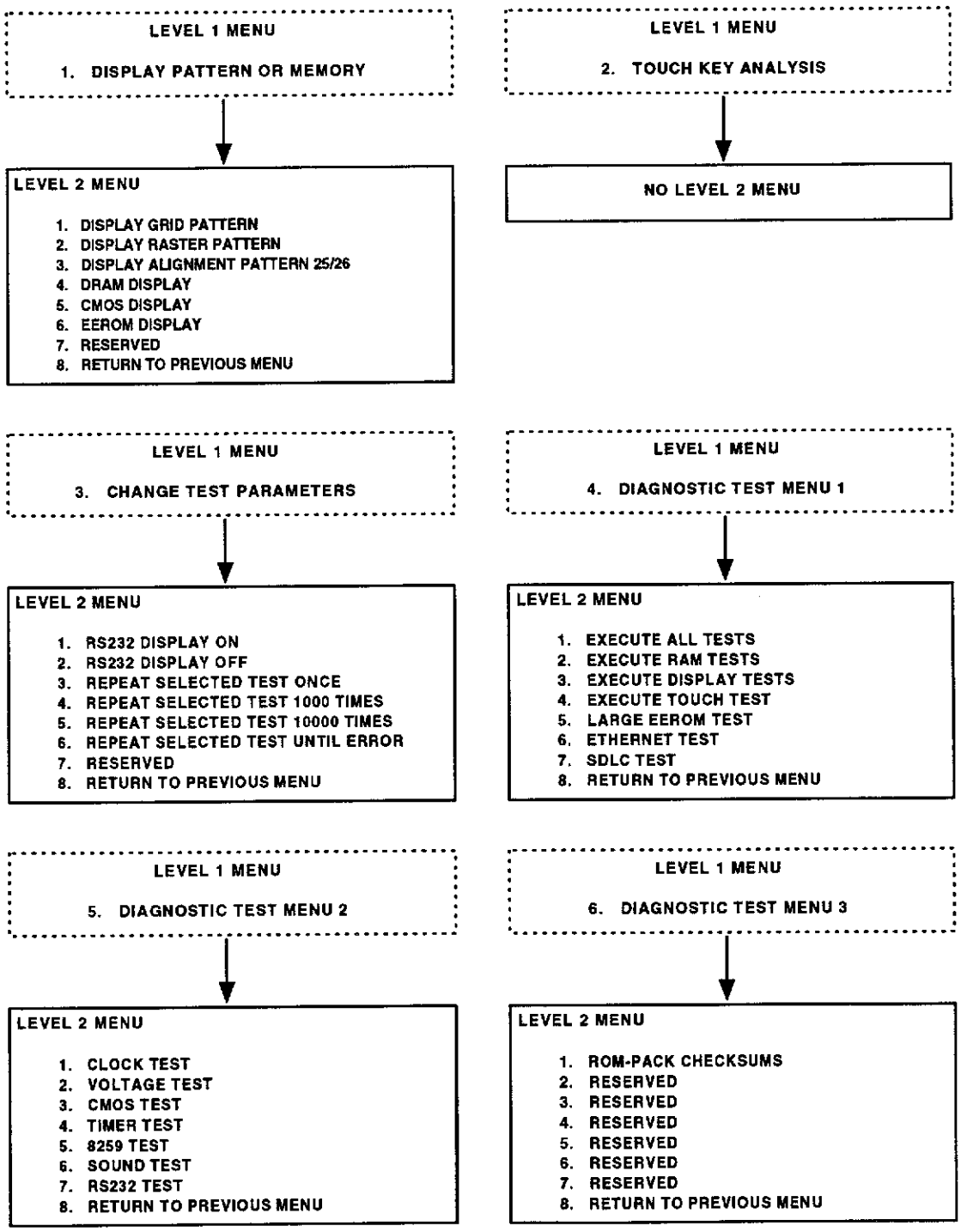
SYSTEM BLOCK DIAGRAM

Two levels of isolation diagnostics and menus are available. The Level 1 menu is the basic test reference menu. Options selected from this menu will display a related Level 2 menu (see the following figure). Use both the Level 1 and Level 2 menus to select a desired test procedure.



When diagnostic tests are run, an ID code for the test in progress is displayed in the lower left corner of the CRT. If a failure occurs, the ID code number is replaced by the failure code. A TEST PASSED or TEST FAILED message is also displayed above the RS232 ON message. Failure codes are described in Table 2-2.

Note:

If a failure occurs during the touch key analysis test (Option 2), the failure message is displayed above the TEST FAILED message indicating the specific location and nature of the error.

The first three Level 1 menu selections are described below.

1. Display Pattern or Memory: Provides test patterns for checkout and alignment of the CRT and allows viewing the contents of RAM and ROM.

2. Touch Key Analysis: Finger movement around the screen results in display of +'s or -'s. These indicate beam status (i.e., beam broken or always on, respectively). There is no Level 2 menu for this selection. The mainframe must be powered down to exit from this test.

Note:

Most 90303 monitors utilize only 24 vertical-pointing beams across the long axis despite the X1 - X48 indications. Breaking a single beam will show two adjacent beam-broken indicators.

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3. Change Test Parameters: Use this menu to select the frequency limits of Level 2 tests.

Power Supply

Overview

The power supply consists of the following elements:

- the AC Miscellaneous Board
- the +/-5VDC uninterruptible power supply
- the +/-12VDC DC-to-DC power converter
- the Power Switch board
- the 12V battery
- the power transformer

After passing through the line EMI filter, the AC input goes to the power switch, fuses, and input voltage selector switches. Once the power transformer steps this voltage down, the bridge rectifier and filter convert it to approximately +24VDC (under load, the actual voltage output varies from about 17 to 31 volts depending on line voltage swing). This +24VDC voltage is sent to the power supply where three Pulse Width Modulator-type regulators, synchronized to an on-board 100kHz clock signal, convert it to regulated +/-5, +/-12, and +60VDC outputs.

- The +5VDC and +/-12VDC outputs feed the CPU board (A1), the Module bucket (A6), and the Display Controller board. The +12VDC also feeds the CRT filament and the fan. The -5V supply provides power for 306440-type Z-axis boards (backward compatible for monitors that have Z-axis circuitry on a separate board). The +5VDC logic output is maintained during AC power outages by switching to a +12V lead/acid battery. This prevents any data loss and user reinitialization. Expected battery run time is a minimum of 5 minutes (typically 10 minutes or longer). When the predetermined discharge level is reached, a solid state switch (a MOSFET) trips a relay to disconnect the battery.

- The +60VDC regulator also produces semi-regulated +/-8VDC, -9VDC, +18VDC, and +/-25VDC output voltages to power the X-Y deflection board (A3). The +18VDC is used to power the battery charger. The +25VDC powers the High Voltage Power Supply (A10), which produces -100V, +400V, and +100KV for CRT operation.

All outputs are protected against short circuit and overload. The 12VDC and 5VDC supplies are also protected from overvoltage.

The power bus monitor keeps the power supply shut off if the input voltage is too low or too high. It also issues the following messages:

- a warning signal (WARN/) if the +5VDC is about to drop out due to an insufficient input voltage
- a power-fail (PFAIL/) to warn the CPU that a power outage or brown-out has occurred, and that battery operation is in effect.

AC Input Assembly

Input
115 vac (220 vac International)

Outputs
- +24VDC (unregulated) to Power Supply PCBA via J-3.
- Battery Enable (Switched +24VDC).

Inputs
- +24VDC (unregulated) from AC Input Assembly. Referred to as the Unregulated Power Bus.
- SYNC: 47.3KHz sync for Pulse Width Modulators from Display Controller (49KHz FOR 90312B). Not used.

Start-Up Control Power
- required before the Pulse Width Modulator ICs can begin running.
- series regulator (U100) IC
- provides approximately 12 volts

±5 VDC DC/DC Converter
- power input to run IC is approximately 12VDC to start and approximately 15VDC once the converter is up and running.
- runs at approximately 100 kHz switching frequency
- protection circuit is activated at 6.5VDC output.
- produces the +/-5VDC regulated voltages.
- produces 15VDC house-keeping supply voltage.
- Only regulator that is backed-up by a (sealed) Lead-acid battery.

±12 VDC DC/DC Converter
- +12VDC Overvoltage Protection circuit set at 14 volts.
- PFAIL/ shuts this regulator down during loss of AC Mains.

Power Up and Shutdown Control
- Over-Voltage Shutdown shuts down both Pulse Width Modulators if +24V exceeds 38 ± 2VDC
- PFAIL shuts down all supplies except +/-5V if +24V drops below 15v.
- SHUTDOWN shuts down +/-5VDC power supply if +24V drops below 9.5VDC.
- WARN is a Four-State signal sent to inform the CPU of power failure. Occurs 3mSec before shutdown.

-3.3V - 5.0V = Signal missing- treat like old CPU.
-2.2V - 3.3V = All's well
-1.1V - 2.2V = Temp>70 C.
-0.0V - 1.1V = Shutdown Warning.

Battery Charger and Control

- The battery charger turns ON when:
  - BTEN (Battery Enable): The +24V (switched by the AC MAINS ON/OFF switch), is present.
  - Switching OFF the AC MAINS switch removes the BTEN signal, de-energizing the Relay, therefore shutting down the Power Supply.
- Battery is always in the circuit and charging, provided the AC MAINS ON/OFF switch is ON, and AC is applied.
- Battery Charger output voltage is 13.8 ± 0.2VDC.
- A fuse blows if the Battery Pack is connected backward.

OUTPUT	HIGH V PWR SUP INPUT	MODULE BACKPLANE INPUT	CPU INPUT	DISPLAY CONT. Z-AXIS INPUT	X-Y DEFLECTION INPUT
+12VDC	–	X	X	X	X
-12VDC	–	X	X	X	X
+5VDC	–	X	X	X	X
-5VDC	–	–	–	X	–
+25VDC	X	–	–	X	X
+58VDC	–	–	–	–	X
-25VDC	–	–	–	–	X
+8VDC	–	–	–	–	X
-8VDC	–	–	–	–	X
-9VDC	–	–	–	–	X
PFAIL	–	–	X	–	–
WARN	–	–	X	–	–

Board Versions

Two different versions of power supply boards are available for the 90303B monitor:

1. One version has a single +60VDC adjustment pot along its upper edge.

2. The other version has four separate adjustment pots along its upper edge (+58VDC, +12VDC, +5VDC, and +13.8VDC).

Procedures for adjusting and removing the single-adjustment board will be described first, followed by the multiple-adjustment version.

Single-Adjustment Version Power Supply Board

Test Points

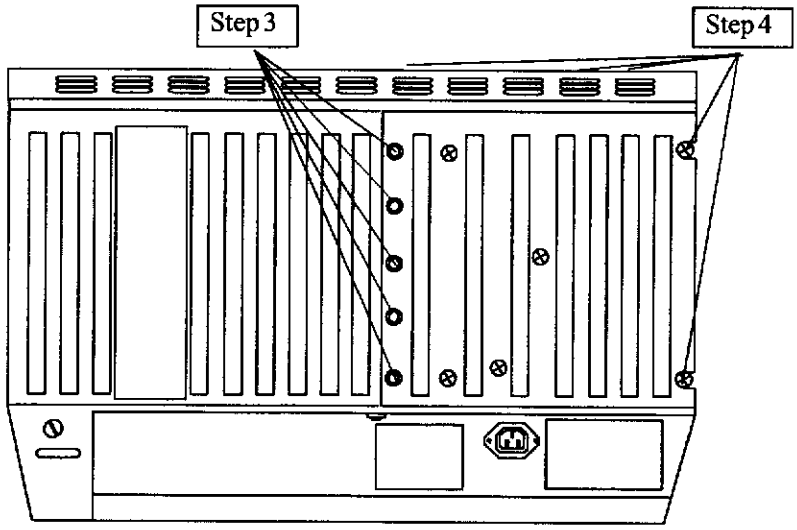
SIGNAL	ADJUSTMENT	TEST POINT
+5VDC	None	TP190
+12VDC	None	TP290
+13.8VDC	None	J4
+58VDC	R-690	TP292
WARN		P19-2
PFAIL		P19-12
GND		TP390

Removing the Single-Adjustment Power Supply

Required Tools: a Phillips screwdriver
an allen wrench (9/64")

Disassembling the Single-Adjustment Power Supply

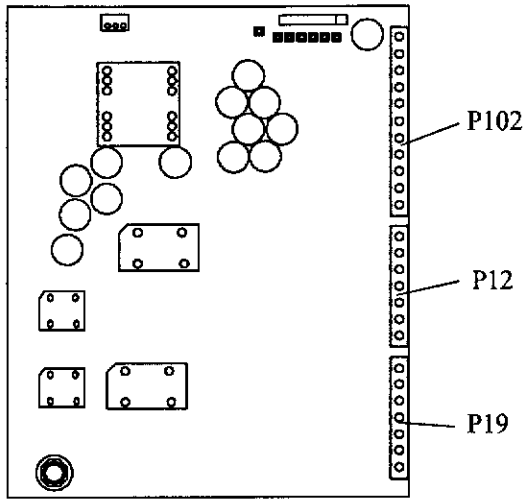
1. Power down the monitor, and remove the power cord.
2. Remove the top cover.
3. Remove the 5 allen screws that hold the left side of the power supply in place (see the illustration).



4. Remove the 2 Phillips screws on the right side of the power supply and the 3 Phillips screws located on the top.
5. Disconnect and remove the 12-volt battery.

6. Disconnect J5 on the AC Input Assembly

7. Disconnect P102 (the top cable), P12 (the middle cable), and P19 (the bottom cable) from the Power Supply Board. See the following illustration.



8. Remove the power supply assembly from the monitor.

Adjusting the Power Supply

Required Tools: a DVM
an Alignment tool

Note:

This monitor contains circuitry that may be damaged by static electricity. Open only at a static-approved workstation.

High voltages are present. Do not wear jewelry or use other than approved test probes.

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1. Turn off monitor power and leave the AC cord connected to power source.

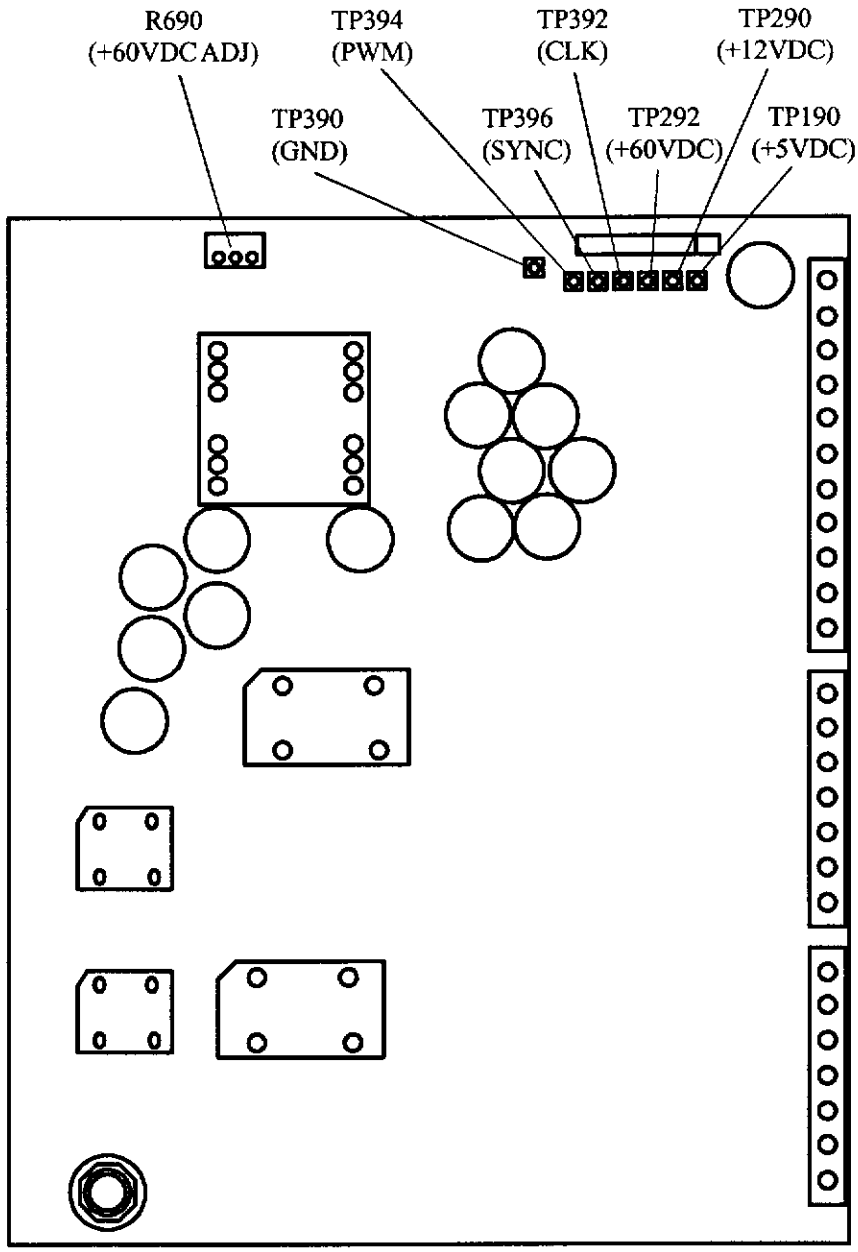
2. Remove the top cover shell and disconnect the 12V battery on the CPU board.

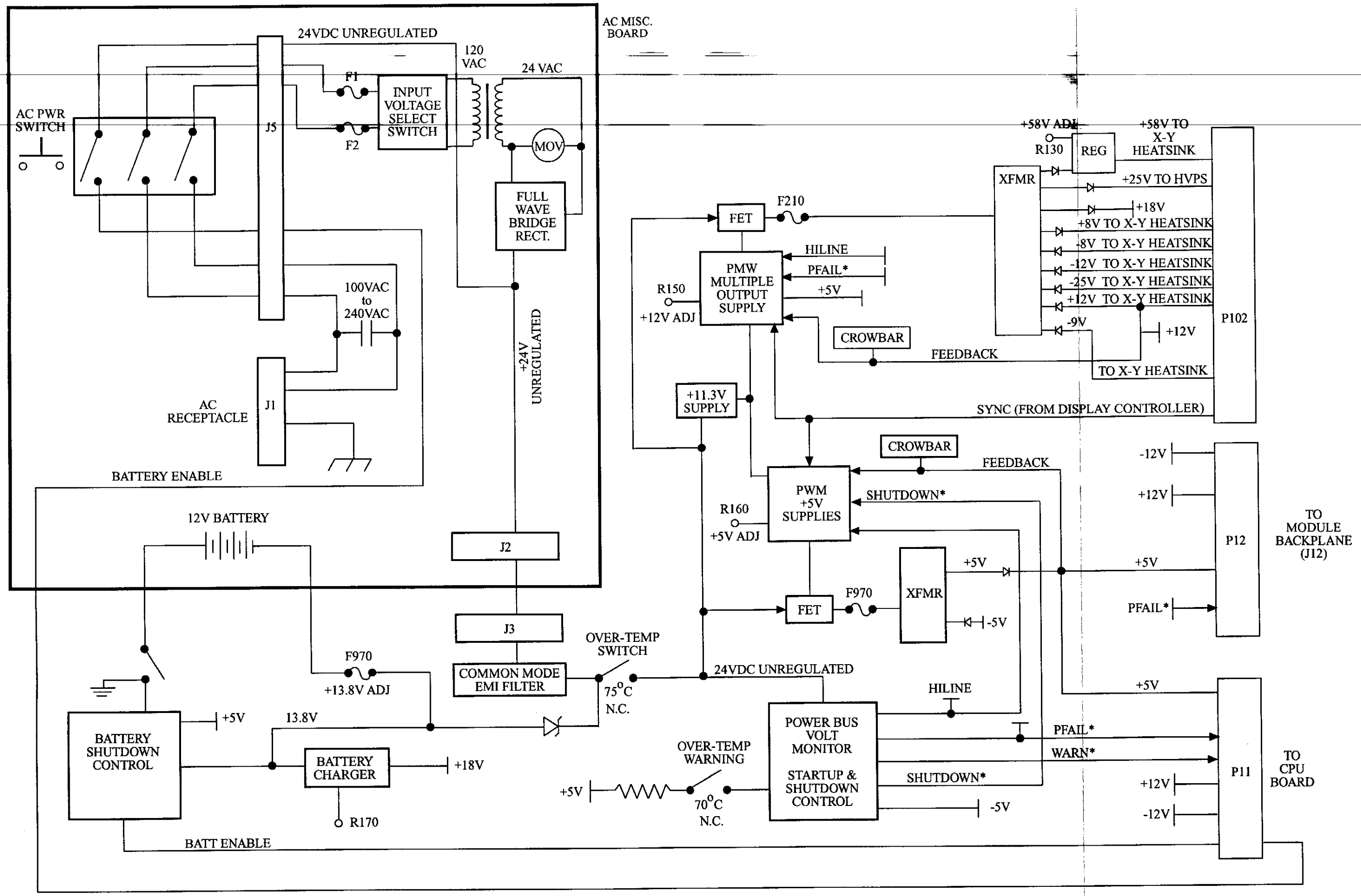
3. Locate the Power Supply Assembly and the Power Supply board (next to the toroid transformer).

4. Turn monitor power switch on and observe power-up diagnostics.

5. Take the following voltage measurements using TP390 for ground reference. All test points are located at the top of the board (see the following illustration). They are clearly marked and are accessible without removing the power supply assembly.

TP292: +60.5VDC ± 0.5V	Adjust R690	(+58ADJ)
TP290: +12.20VDC ± 0.15V	No adjustment	
TP190: +5.10VDC ± 0.1V	No adjustment	





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POWER SUPPLY BLOCK DIAGRAM

Multiple-Adjustment Version Power Supply Board

Test Points

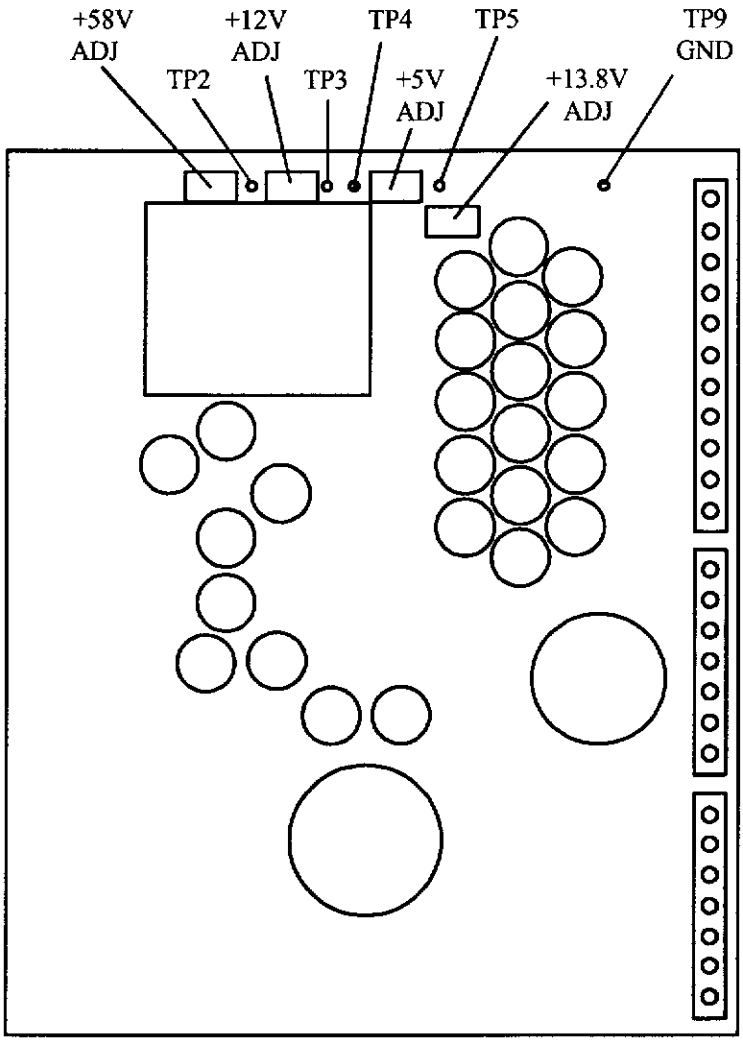
SIGNAL	ADJUST	TEST POINT
+5.15 +/-0.05VDC	R160 (+5V ADJ)	TP4
+12.20 +/-0.1VDC	R150 (+12V ADJ)	TP3
+13.85 +/-0.1VDC	R170 (+13.8V ADJ)	TP5
+58.5 +/-0.5VDC	R130	TP2
GND		TP9

Removing the Power Supply

Required Tools: a Phillips screwdriver
an allen wrench (9/64")

Disassembly

1. Power down the monitor and leave the AC cord connected to power source.
2. Remove the top cover and disconnect the 12V battery.
3. Locate the Power Supply Assembly and the Power Supply board (next to the toroid transformer).
4. Turn the monitor power switch ON and observe the power-up diagnostics.
5. Take the voltage measurements shown in the table above and adjust to within specifications if necessary. All test points and calibration pots are clearly marked and accessible without removing the power supply assembly (see the following illustration).



Testing the Monitor Battery

1. Load the Monitor with two or three different parameters.
2. Set the alarm limits for higher and/or lower than the default.
3. Allow Trending to run for a minimum of 2 minutes.
4. Pull the AC cord out of the wall or from the back of the Monitor.
5. With a fully charged battery, connect a voltmeter to the +5VDC test point and ground, and unplug the AC power cord (leave AC switch ON). Verify that the display blanks and the + 5 volts remains stable for a minimum of five minutes. The CPU LEDs should be randomly flashing at half intensity.
6. Re-connect the AC cord after a minimum of 2 minutes but not more than a maximum of 5 minutes. The display should return without going through power-up diagnostics.

7. Verify that all memory and settings (e.g., alarms, trends, classes, etc.) are still present and have not changed.

8. If memory and/or settings have changed, replace the battery.

Replacing the Battery

Recommended replacement interval for the rechargeable battery is every 2 to 3 years.

1. Turn off power to the Monitor, and remove the cover.

2. Remove the battery hold-down bracket, and unplug the battery wires.

3. Replace the battery.

4. Re-install the battery bracket and cover, and turn on AC power.

5. Allow the new battery to charge for 24 hours, then perform a battery test.

Display Controller Board

The display controller contains its own voltage references, provides refresh of its own dynamic RAMs, and will shut down the display (to protect circuitry and CRT phosphor or to prevent old data frozen on the screen indefinitely) if either the CPU software or deflection circuitry fails.

The display controller receives waveform and bit-mapped alphanumeric and graphic data, and stores it in on-board DRAM for display. The DRAM is divided into two 32K by 16-bit sections. One is used for waveform storage, and the other is used for pixel intensification information.

To pass data to the display controller, the CPU is granted control of the display RAM by asserting a request to the RAM access arbitrator. The access arbitrator then controls the address multiplexers and data to be transceived and couples the CPU address/data bus to the display controller RAM. The CPU access to display RAM is interleaved with the display controller's accesses to display RAM (required for generating the display). For this reason, CPU access is transparent to the display function so that display functions continue without interruption. Control information such as data type (bit-map or waveform), trace position, horizontal deflection speed, start position, trace length, etc., are stored in display RAM along with actual data. Timing and sorting circuitry is included to remove control information from the data stream to allow the display controller to take the right action.

Waveform data for waveform display is read out of display RAM, latched onto the display data bus (DD), and routed to the Y-axis waveform digital-to-analog converter (DAC). The Y analog signal is then summed with trace offset information from the Y position DAC and amplified. It is sent to the deflection amplifier as a Y-out composite, after passing through a "vector generator" to smooth the waveform quantizing.

At the start-up of each trace, X-sweep information is sent on the display data bus to the X-sweep position DAC, and sweep speed ramp generator. These outputs are summed and amplified and sent to the deflection amplifier as X-out. Geometry correction circuitry pre-distorts X-out so that it will appear linear on the CRT.

The CRT face is divided into a map of pixels 384 high by 560 wide (640 wide in optional PC Mode). Each pixel is represented by one bit of information stored in RAM on the display controller. As display raster proceeds from bottom to top in a fast scan and left to right in a slow scan on the CRT, each bit is read out of RAM. This pulses the beam ON or OFF and sets intensities.

For alphanumeric and graphic displays, data is read out of the bit map and pixel attribute RAM, converted to serial, decoded to BLNK and BRIT signals, then sent to the Z-axis circuits. Simultaneously, the vertical position control word (which has no logical function during raster) is latched and read to control overall display intensity. This enables the user to manually change overall screen brightness (i.e., entire raster and all of waveforms).

A 47kHz timing signal from the display controller produces a fast vertical sawtooth signal on the Y-axis of the deflection. This fast sawtooth signal becomes the vertical raster deflection signal. The 47kHz is also used to sync power supply operation.

A blanking summing gate, which also controls the BLNK/BRIT signals, is used to blank the beam for such conditions as retrace, deflection failure, or CPU failure.

The jump address latch is used to start at a selected RAM address for block transfers of data to the display. For example, a block transfer is a direct written waveform, graticule line, or raster (for bit-mapping). The RAM address for the next block of data to be displayed is held in the jump address latch. Once the block being displayed is finished, the jump address is transferred to the display address counter and display address bus. Display of the next block commences from that address.

Z-out controls display intensity through software. This is accomplished by loading intensity control data from the display data bus into the intensity control DAC for each piece of the display. During a trace, the out put of the DAC is amplified and sent to the Z-axis circuits to control CRT grid 1 and cathode voltage. The relative brightness of the screen is also the result of a combination of user selection, the ambient light sensor, and the speed of the waveform currently being written on the screen (high frequency intensification).

The display controller receives a 7.392kHz sync clock signal from the CPU, divides it down to 56Hz and uses it for refreshing the display. This signal is asserted to the CPU in the form of an interrupt to force the CPU to send new display data.

Two different display controller boards with different oscillators are used for display timing:

- For 90303B and 90311B monitors, the display controller board has an on-board 25MHz oscillator that is divided down to 47kHz to sync the power supply switching regulators and vertical sweep circuits.

- 90312 and 90303-08 monitors use a different display controller board with an on-board 26MHz oscillator that is divided down to 49kHz to sync the power supply switching regulators and vertical sweep circuits.

The Z-out signal is offset by the brightness adjustment, scaled by the contrast adjustment, and then magnified by the Z-out amplifier to different steps of voltage between -10 and -80 volts.

The blanking amplifier then drives the CRT control grid between -100 volts and the negative voltage set by the Z-out amplifier. Blanking for all purposes, and brightness of individual traces, etc., are controlled in this manner.

Logic signals BRIT (attributes) and BLNK/ control cathode and grid 1 beam ON/OFF and brightness.

The high frequency intensification (HFI) circuit senses Y-out to add intensity during fast Y-beam transitions to ensure uniform intensity throughout the whole trace. The Y-ramp signal for raster is not included in Y-out. Grid 1 is also controlled by Z-out, which regulates overall display intensity, as well as brightness of individual traces.

Grid 4 is the focus grid and is adjusted both by an internal manual control and dynamically. X-out is used to generate the first order dynamic focus correction.

A high voltage power supply assembly is used to provide -100VDC and +400VDC and 10kV for CRT anode voltage. The high voltage power supply uses an input voltage of +25VDC.

CRT protection circuitry is active during power-up and power-down to prevent phosphor burning at screen center. Protection is accomplished in the Z-out amplifier when the +12VDC starts to decay at power down. Static protection is provided by spark gaps on the cathode and G1.

X-Y Deflection Boards

X-Axis

Horizontal deflection (X-axis) takes place on the deflection board mounted on the inside of the heat sink on the rear of the monitor.

A transconductance amplifier takes the X-out voltage from the display controller and converts it into an output current through the yoke and sensing resistor. The feedback path provides the correct voltage across the yoke and sensing resistor so that output current is proportional to input voltage.

The X-crossing detector senses when the beam stops moving and outputs signal XCR to the display controller. If the beam stops moving in either the X or Y axis direction for more than 1.4 frames, the display controller blanks the CRT to prevent phosphor damage.

Y-Axis

Vertical deflection (Y-axis) takes place on the deflection board mounted on the rear heat sink. The physiological waveforms and staircase positions from the display controller DACs are applied via Y-out. A ramp generator in the Y-axis, when controlled by signal Y-RET from the display controller, produces the fast sawtooth wave shape required for the vertical component of a raster display. Either the combined signal of waveform and staircase, or the fast sawtooth signal is selected by a multiplexer and fed to the deflection.

When control signal RAST is high, the raster ramp generator is allowed to run, raster positioning is enabled, and both go through the Y-correction amplifier, resulting in fast sawtooth Y-axis raster deflection. Text can be written to the face of the CRT by turning the beam on and off as the bit-mapped raster scan progresses. When control signal RAST is low, the raster ramp generator is disabled, raster positioning is unhooked, and Y-out is allowed to go through the Y-correction amplifier. Waveforms are then painted on the face of the CRT.

The Y-correction amplifier provides a linear beam deflection at different vertical deflection distances from the center of the CRT screen. This corrects for nonlinear CRT/deflection operation.

RAST also controls switchover of supply voltages used for deflection. This circuit connects +25VDC and +8VDC to the Y driver and output stages during waveform display, but disconnects both from the Y driver during raster.

The retrace "kicker" pulls the most positive supply terminal of the Y driver and Y output stage to +60VDC during scan line retrace intervals and lets them drop to ground during scan line trace. The retrace kicker becomes an open circuit during waveform display.

The feedback path provides the correct voltage across the yoke and sensing resistor so that output current through them is proportional to input voltage. The damping path provides linearization of the waveform during scanning.

The vertical settled detector is made up of a pair of comparators that continually detect whether the Y deflection is moving faster than a preset rate. It does so by sensing the voltage across the deflection yoke. The output of the circuit is used to ensure proper display appearance of clipped waveforms (i.e., has the deflection settled at the vertical position for clipping before allowing the blanking for the dotted line to begin) and to cause the CRT to be blanked if the vertical deflection stops for more than 1.4 frames.

Functional Review

Horizontal (X-Axis) Deflection

- Develops X-POWER drive through X-yoke winding
- Horizontal Crossing Detector (XCR)
- Adjustments
  - X-Size (R96)
  - X-Position (R47)

Vertical (Y-Axis) Deflection

- Develops Y-POWER Drive through Y-yoke winding
- Generates Raster Ramps (enabled by Display Controller)
- Fast Retrace (60V 'kicker') for Raster
- Vertical Settled Detector (VSTL)
- Adjustments
  - Y-Size (R77)
  - Y-Position (R46)
  - RASTER Size (R60)
  - RASTER Position (R104)
  - Bottom Raster Linearity (R135)
  - Gimmick Cap

Display Controller

- Sends request to CPU for new data (Frame Time Int)
- CPU sends next frame of data to Display Controller
- Text/Data control
  - Stored in PPixel/Attribute RAM
  - Read out during raster mode to Pixel Shift and Attribute Registers (Parallel to Serial)
  - Sent to Z-AXIS circuitry for Beam ON (1) or Beam OFF (0), +and-NORM/BRIGHT
- Waveform/Data control
  - Stored in waveform RAM
  - Written to waveform DAC
  - Written to offset (position) DAC
  - Summed and sent to X-Y Deflection Board (Y-out)

Watchdog Timers

- CPU Hung Timer
  - Will blank screen if CPU does not update Display RAM within 4 frame times (76.2mSec)
- Deflection Stall
  - Will blank screen within 240mSec if Vertical (VSTL) or Horizontal (XCR) deflection fails, to avoid burning CRT phosphor

Deflection Timing

- Supplies SYNC to power supply Pulse Width Modulators (47.3Hz)
- Frame Time interrupt (56Hz)
- X-Ramp generation

Adjustments

- DAC De-glitch (C50)
- X-Ramp Size (R87)
- Intensity (R142)
- Contrast (R143)
- Focus (R149)

Test Points

- TP 20 - Ground to unblank everything. Aids in isolating display (deflection) problems
- TP 11 - Ground to override CPU HUNG watchdog timer. Aids in isolating CPU or Display Controller problems
- TP 1 - Ground to defeat High Frequency Intensification
- TP 12 - Frame Sync (56Hz)

Z-Axis Functions

- Blanking (Beam ON/OFF)
- Intensity
- Focus

Removing Deflection Boards

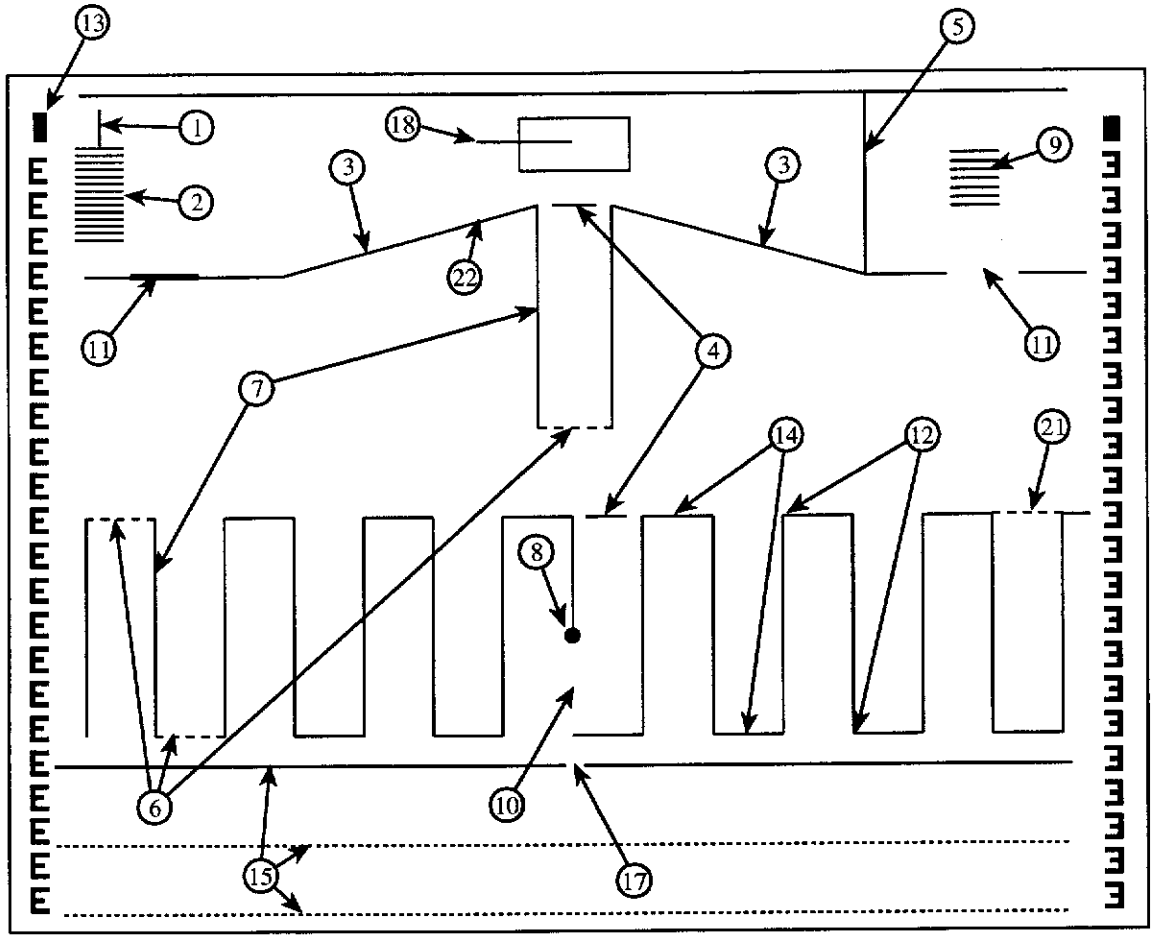
1. Power down the monitor and remove the power cord from the back panel.
2. Disconnect all cables from the Display Controller PCBA.
3. Remove the Display Controller PCBA.
4. Remove the allen screws and phillips screws that secure the X-Y heatsink.
5. Remove the cable that connects the X-Y output to the CRT yoke.
6. Remove the cable that connects power to the X-Y heatsink.
7. Remove the X-Y heatsink.

Alignment Pattern Screen

The Alignment Pattern screen exercizes all circuits on the Display Controller board. If this procedure cannot be completed, replace the Display Controller board.

To obtain an alignment pattern screen on the CRT, place the monitor in the Isolation Diagnostics mode to obtain menu selection #1, *Display Patterns or Memory*, and select *Display Alignment Pattern* from the Level 2 menu. A screen display will appear (see the next figure).

1. Interrupt response: Verify the presence of the small vertical line.
2. Pointer address bits and jump function: Verify the presence of 15 horizontal lines. Each line is a different length to make them easier to read.
3. Waveform DAC linearity: Verify that ramp slopes are smooth and linear. A small amount of noise (0.2-0.4 mm) is normal.
4. Waveform dynamic ranges (4 cm and 8 cm): Verify that the ramp waveform and square wave reach the vertical height of their respective alignment marks.
5. Deflection settling handshake: Verify that the vertical line reaches from the ramp wave to within 2 mm of the top horizontal line.
6. Clipping indicator: Verify that the break in the ramp waveform has dots at the bottom and that the square wave also has one of its top and bottom edges dotted. (Speed of dot motion during test pattern is irregular and varies with any blockage of touch screen.)
7. Vertical settled predicator: Verify that the sides of the square wave and ramp (leading toward the clipping) either touch the dotted sections of the square wave or come within 2 mm.



8. Bright dot Pause: Verify that the bright dot in the square wave is a dot and not a vertical segment (dash).

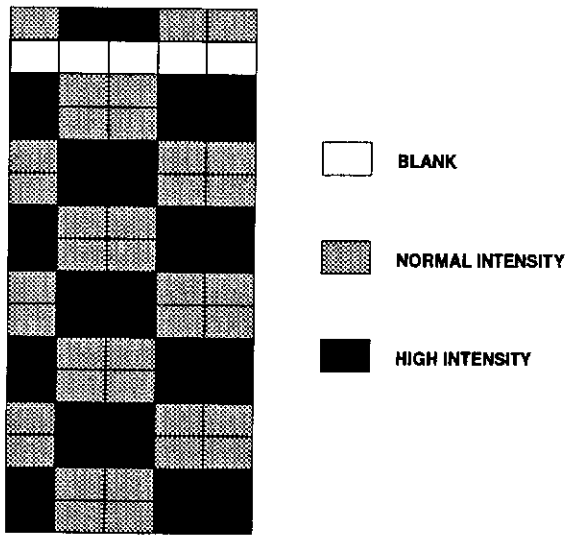
9. Z-out levels: Verify that there are seven separate levels of intensity. The appearance of intensity levels is affected by the setting of the contrast adjustment on the Z-axis board.

10. High frequency intensification disable: Verify that the falling edge of the square wave is blank from the bright dot down to the bottom of the square wave.

11. Waveform intensify and blank : Verify that there is a bright section of the ramp waveform on the left and a blank portion on the right.

12. Overshoot: Adjust gimmick capacitor on X-Y deflection for best overall appearance top and bottom.

13. Raster Pixel Intensification Function: Verify that the figure below appears in the top left-hand corner of the alignment pattern. The intensity control may have to be decreased or the ambient light sensor covered to view this clearly. The pattern at top right corner of display is entirely at normal intensity.



14. Intensify disable: All tops and bottoms of the square wave must be equal intensity. Otherwise, tops will be as bright as bright section of item 11.

15. Waveform clamp function: Verify that the horizontal lines are present, smooth and not ragged. Note that bottom two are dotted. If waveform clamp is not working, bottom two lines will be full of spikes or noisy (several cm peak-to-peak), and the upper line of the three will be at a lower vertical location.

16. Sweep Speeds: Verify that the top horizontal line, ramp trace, and square wave trace come within 3 mm. of the right-hand vertical line, that the upper two of the three bottom horizontal lines come within 3 mm of the left vertical line and that the bottom horizontal line comes within 4 mm of the left vertical line. R87 on the Display Controller simultaneously adjusts the lengths of all of these traces plus the widths of the raster and grid patterns (all generated with various sweep speeds). Readjust R87 for the best overall compromise, if required.

17. X-Position Disable: Verify that the top line of the bottom three lines has a small gap in the center.

18. Overall Display Timing: Verify the presence of a line partially through the box at the top of the screen. The box must have both a steadily blinking line segment and a portion of the solid line segment inside of it. Verify that the steadily blinking segment is contained entirely within the box, and a randomly flashing line to the right of the steadily flashing line exists.

Note:

Display controllers with a 26 MHz oscillator for Y1 will have a non-flashing 3 cm. line centered in the upper portion of the box, and a flashing line right below the non-flashing line. Ignore the upper of the two lines for such boards.

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19. Auto Brightness: Verify that the display intensity noticeably changes when the ambient light sensor is covered. The contrast control of the Z-axis board must be properly set.

20. Memory wraparound: Verify that the right half of the ramp wave and right three-fourths of the square wave are as shown. Distortion is dramatic if wrap around is not working.

21. Dynamic range settling time test: Dotted line should be entirely at same vertical height as the top of the square wave. (Dots normally are moving.)

22. Y.DAC de-glitch check: At this location, a small pip will show if C50 on the Display Controller Board is not properly adjusted

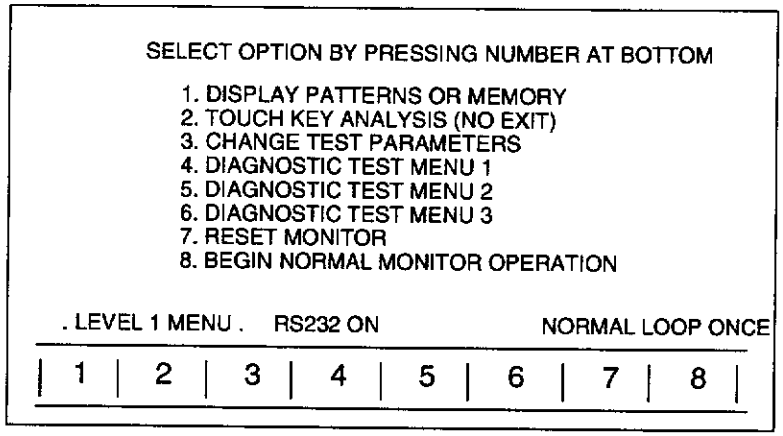
Display Alignments

Required Equipment

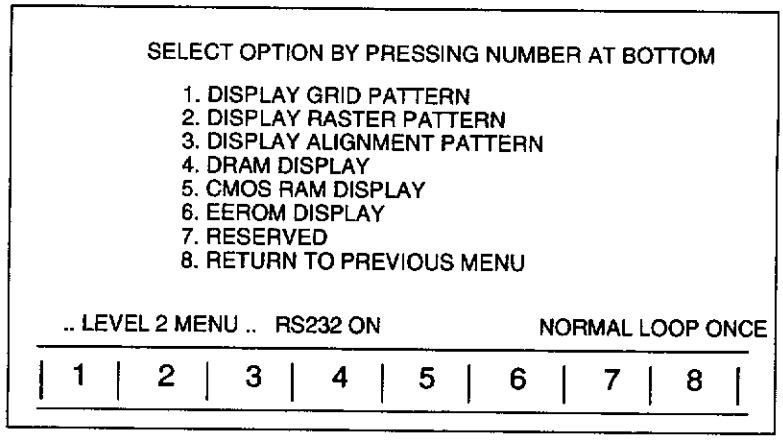
- Jumper wire
- Small flat-blade screwdriver (about 6 inches long)
- Patient simulator

Preliminary Set-Up

1. Enter the Diagnostics menu by cycling power to the monitor and holding a finger in each lower corner of the screen during the power-up sequence. The following menu will be displayed.



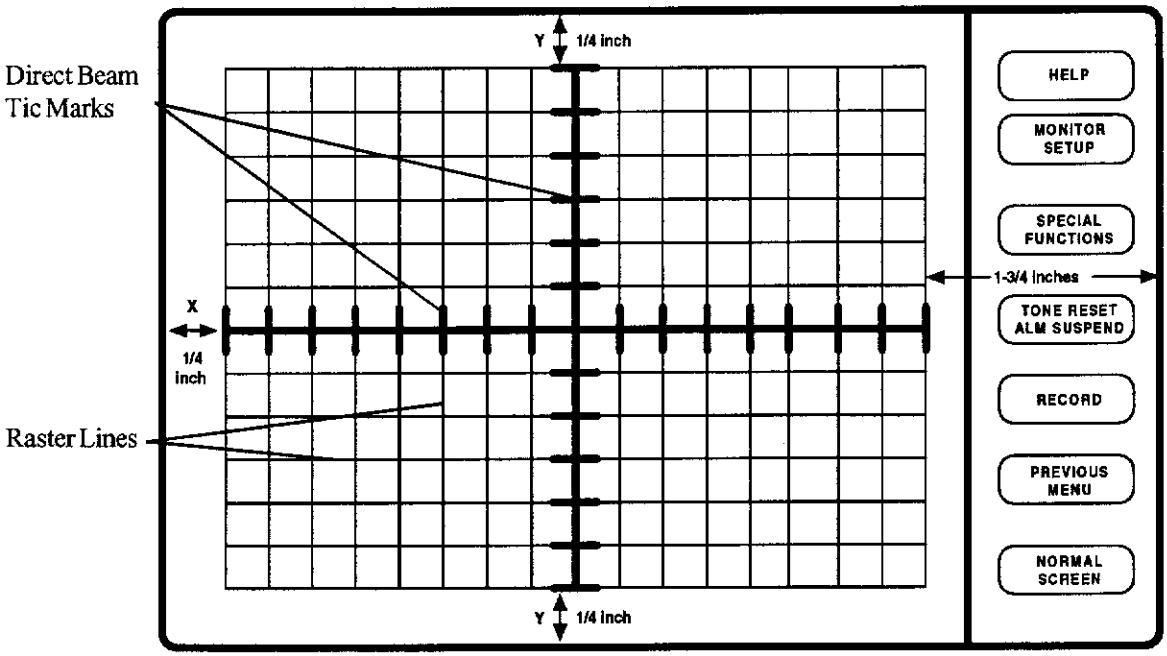
2. Touch 1, **DISPLAY PATTERNS OR MEMORY**, on the Level 1 Menu. This will display the Level 2 Menu.

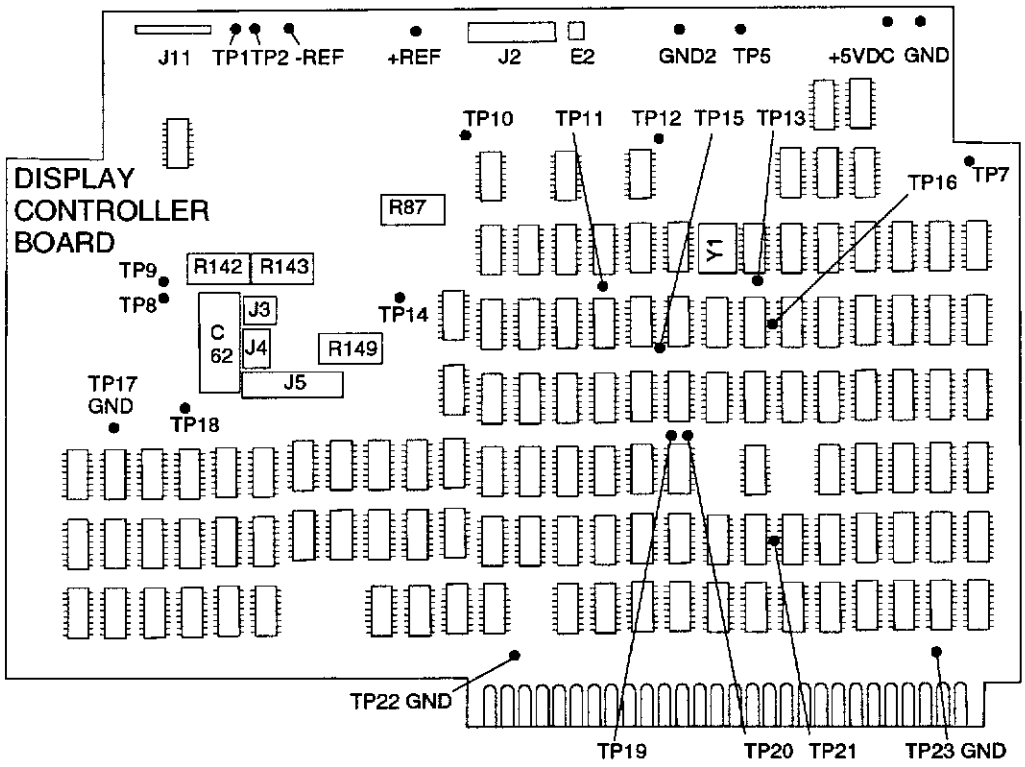


3. Touch 1, **DISPLAY GRID PATTERN**, on the Level 2 menu to start the deflection checks and alignment procedure.

Direct Beam Positioning

Refer to the figures below for steps 1-6.





Refer to the table below for this procedure.

ADJUSTMENT	ADJUST	LOCATION
Y-Position	R46	Deflection Amplifier
Y-Size	R77	Deflection Amplifier
X-Position	R47	Deflection Amplifier
X-Size	R96	Deflection Amplifier
Intensity	R142	Display Controller

1. Decrease the intensity of the Raster lines by turning R142 CCW until only the Direct Beam Tic Marks (the intensified short lines on the pattern) are visible.

2. Adjust R46 (Y-Position) and R77 (Y-Size) on the Deflection Amplifier until the top Y Direct Beam tic mark is 1/4 of an inch from the top of the screen and the bottom Y Direct Beam tic mark is 1/4 of an inch from the bottom.

CAUTION

Overadjustment of R77 can damage the X-Y Deflection Board.

---

3. Adjust R47 (X-Position) and R96 (X-Size) until the Left X Direct Beam tic mark is 0.25" from the left of the screen and the Right X Direct Beam tic mark is 1.75" from the right of the screen.

Raster Grid Positioning Procedure

Note:

Do NOT readjust R46, R47, R77 or R96 during the Raster Grid Positioning Procedure.

Refer to the table below for this procedure.

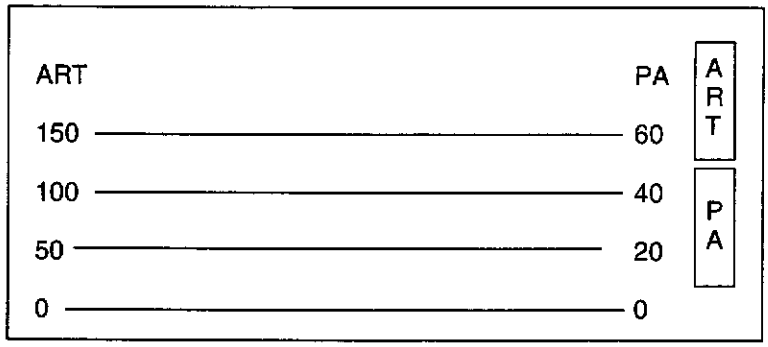
ADJUSTMENT	ADJUST	LOCATION
X-Ramp	R87	Display Controller
Contrast	R143	Display Controller
Raster Position	R104	Deflection Amplifier
Raster Size	R60	Deflection Amplifier
Raster Bottom Linearity	R135	Deflection Amplifier

1. Center R143 on the Display Controller board.
2. Center R135 on the Deflection Amplifier.
3. Adjust R87 (X-Ramp) on the Display Controller until the Right Raster line overlays the Right X Direct Beam Tic.
4. Adjust R104 (Raster Position) and R60 (Raster Size) on the Deflection Amplifier until the Y raster lines overlay the Y Direct Beam Tic Marks. If necessary, readjust R135 on the Deflection Amplifier for the Bottom Raster line.
5. Return to normal monitor operations.
6. Continue on to the Intensity Alignment procedure.

Intensity Alignment Procedure

1. Install a dual-pressure module into the monitor.
2. Connect a pressure cable from a pressure simulator to the top Blood Pressure connector on the module. Configure the simulator for a pulmonary artery (PA) line.
3. Touch the Blank Pressure soft key.
4. Touch the LABEL SELECT soft key.
5. Touch the ART soft key.
6. Touch the ZERO soft key.
7. Touch the SCALES soft key.
8. Select SCALES ON.
9. Press the arrow keys until ART SCALE = 180.
10. Connect a pressure cable from a pressure simulator to the bottom Blood Pressure connector on the module. Verify that the simulator is configured for a pulmonary artery (PA) line.
11. Touch the Blank Pressure soft key.
12. Touch the LABEL SELECT soft key.
13. Touch the PA soft key.
14. Touch the ZERO soft key.
15. Touch the SCALES soft key.

16. Touch the SCALES ON/OFF soft key.
17. Press the arrow keys until the PA SCALE = 60.
18. Touch the NORMAL SCREEN hard key.
19. The Display should be the same as shown below.



20. Press the MONITOR SETUP hard key.
21. Touch the MONITOR CONFIG soft key.
22. Touch the BRIGHTNESS soft key.
23. Touch the down arrow key repeatedly until the box becomes dotted, indicating that the lower limit has been reached.
24. Press the NORMAL SCREEN hard key.
25. Turn the simulator on.
26. Select ART (BP1 menu) and press execute.
27. Select PA (BP2 menu) and press execute.
28. Cover the Ambient light sensor located on the top right corner of the Touchscreen.
29. Decrease the intensity of the displayed waveforms by turning R142 on the Display Controller board CCW until the waveforms are no longer visible.
30. Increase the intensity of the waveforms by turning R142 CW until the waveforms reappear faintly.
31. Uncover the ambient light sensor.

Contrast Adjustment Procedure

Refer to the table below for this procedure.

ADJUSTMENT	ADJUST	LOCATION
Contrast	R143	Display Controller

1. Ensure that a minimum of two waveforms are displayed.
2. Touch the pressure softkey labeled ART or PA.
3. If necessary adjust R143 for the best contrast between the displayed waveforms.

Focus Adjustment Procedure

Refer to the table below for this procedure.

ADJUSTMENT	ADJUST	LOCATION
Focus	R149	Display Controller

1. Touch the pressure softkey labeled PA.
2. Adjust R149 for the best focus of the PA inverse video characters.

Bottom Raster Linearity Procedure

Refer to the table below for this procedure.

ADJUSTMENT	ADJUST	LOCATION
Raster Bottom Linearity	R135	Deflection Amplifier

1. Press the NORMAL SCREEN hard key.
2. Press the MONITOR SETUP hard key.
3. Touch the RECORDER CONFIG soft key.
4. Touch the ALARM PARAMS soft key.
5. Adjust R135 so that the lettering in the upper and lower part of the soft key box are proportional.

Touchscreen

The infrared touch screen consists of four PCBAs containing a total of 56 emitter/detector pairs. The emitter/detector pairs are arranged in a 24 (horizontal) by 32 (vertical) matrix around the CRT face (see the following illustration).

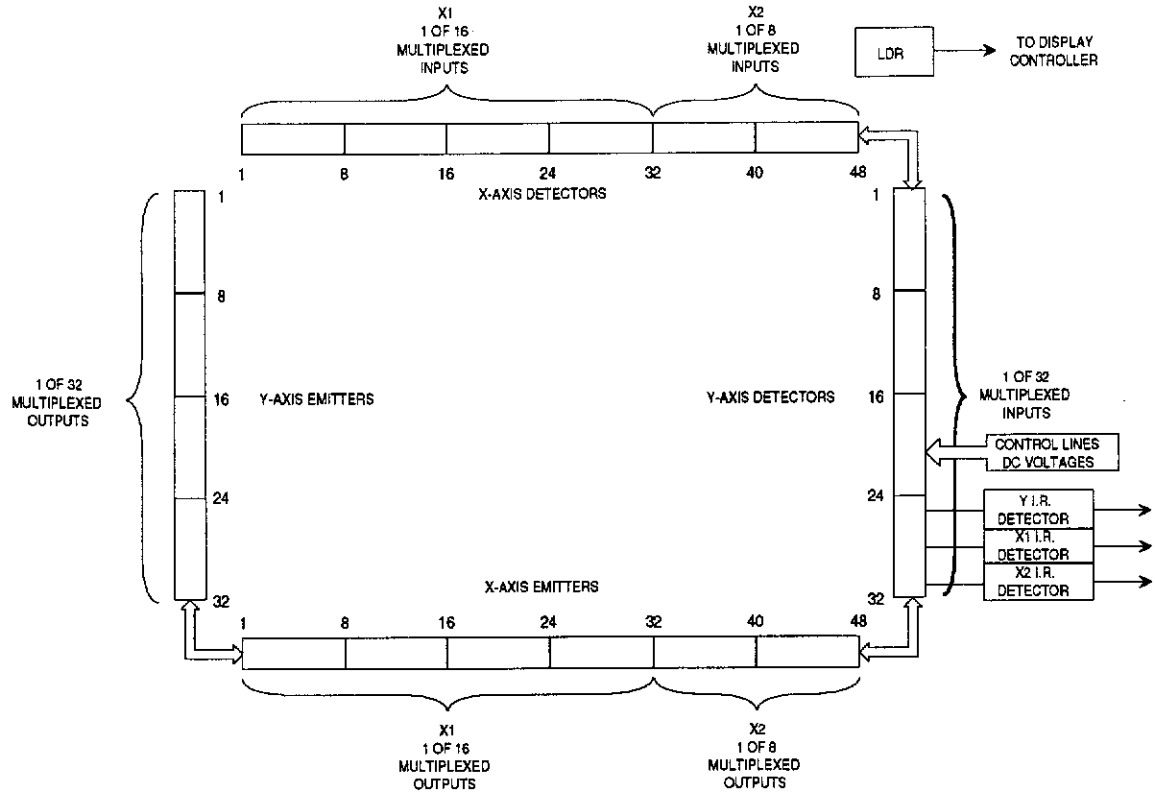
Note:

The original board set had 48 devices along each horizontal board. Presently, only the odd numbered devices are installed even though all device numbers appear silkscreened on the board. Some instruments may be found with all 48 devices installed.

Each emitter is situated across from its matching detector in front of the CRT. Two X and one Y emitters are scanned with a 30 kHz carrier every 1.15msec to produce coordinate pairs. The +5VDC supplied to the touchscreen is protected by a fuse (F1) located on the CPU board.

Software generated controls (soft keys) are activated by the touch of a finger which interrupts the infrared beams to the detectors. The detected absence of a carrier is processed by a tuned amplifier and a peak detector and comparator to sense the presence or absence of the infrared beam. The infrared detectors are controlled and monitored by an 8741/8341 microprocessor located on the main CPU board. The microprocessor is a Remote Universal Peripheral Interface (RUPI) which communicates with the main CPU through three registers (input, output and status).

The IRTS controller is clocked by a 4MHz clock derived from the 80186 clock. The SDLC clock is divided down to produce a 30 kHz carrier signal. Though it has no touchscreen function, the ambient light sensor (light-dependent resistor or LDR) is physically mounted on the top touchscreen board. It couples to the display controller via a two-wire cable.



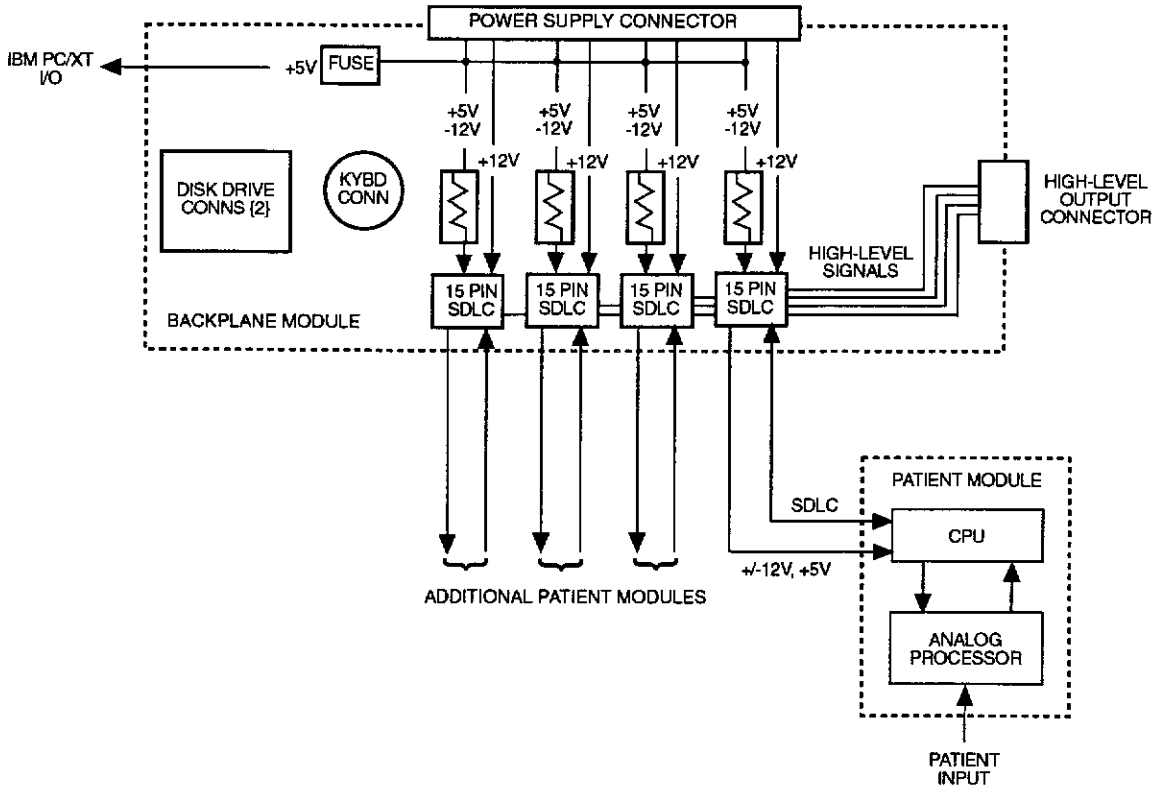
Removing the Touch Screen

1. Turn off the power switch and remove the AC power cord.
2. Remove the monitor top cover.
3. Pry the grounding clip from the top corner of the Touch Screen. Do NOT unscrew the ground wire from the CRT mounting hardware.
4. Remove the connector from E3 of the Display Controller.
5. Push the tabs located on top of the touchscreen (behind the Front Bezel assembly) down and forward.
6. Carefully swing the Touch Screen out and remove the signal cable from bottom.

Backplane

The Module Backplane contains the power supply filtering circuits to allow "hot plugging", i.e., insertion and removal of patient modules while the monitor is turned on. In addition, connectors are provided for SDLC communications with the patient input modules and for the connection of other peripheral devices, namely a disc drive and an external keyboard. A fuse located on the backplane protects the IBM PC/XT style keyboard when that option is in use.

The CPU board contains a rear panel SDLC connector for connection of an External Module, a Bedside Recorder, or Telemetry Receiver Housing.

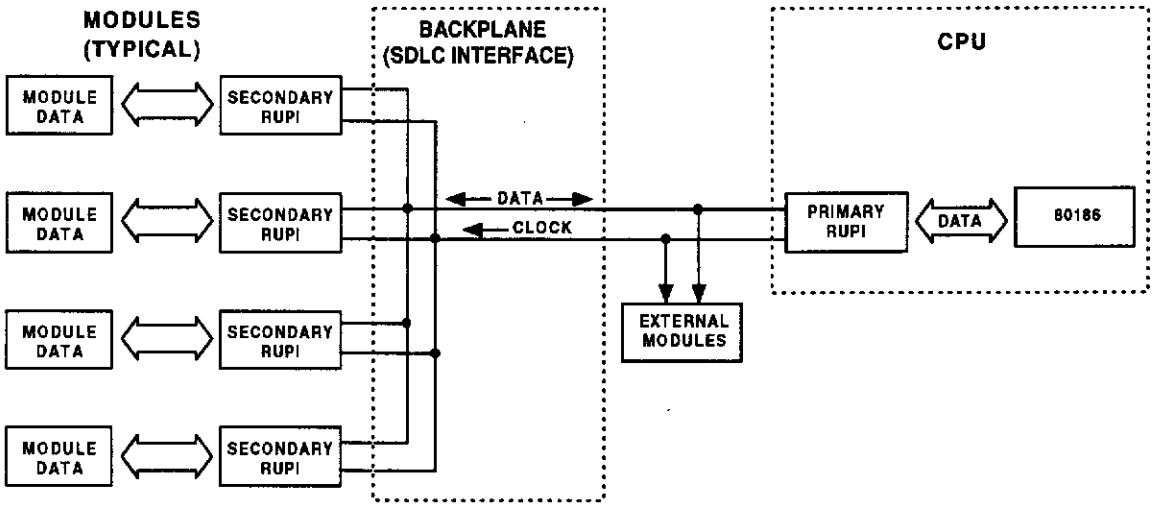


Synchronous Data Link Control

The Synchronous Data Link Control (SDLC) bus* is a two mega-bit-per-second bi-directional serial bus. The bus is controlled by the primary Remote Universal Peripheral Interface (RUPI) located on the CPU board. Each patient input module has a secondary RUPI which is controlled by the primary.

The patient input modules acquire physiological data from the patient, convert the analog signals to serial digital data and send this data to the SDLC controller on the CPU board via the SDLC bus. Module display information for the monitor is also transmitted on the SDLC bus. The CPU will assert control information received from the touchscreen to the modules via the SDLC bus. Transfer of data is controlled by the 80186 CPU.

The Remote Module Housing, Flexports, PC Bedside Recorder and PC Telemetry Processor use the SDLC bus for communications.



* *SDLC is a communications protocol developed by IBM (Trademark of International Business Machines). It provides bit-serial information transfer over a data communications channel, sequencing of information frames, error checking, addressing, and link protocol. For further information on SDLC, refer to IBM publication #GA27-3093-2.*

CPU Board

The CPU Board is based on a high integration 16-bit 80186 microprocessor with integrated functions including two DMA channels, 3 programmable 16-bit counters, memory and I/O selects, wait state generator, clock generator and interrupt controller.

The CPU board provides:

- 6 banks of 256K each of system DRAM
- up to 5 banks of 256K each of ROM on the ROM-pack
- up to 16 K of battery-backed CMOS RAM
- up to 2 K of EEROM and SDLC controller
- an infrared touch screen controller
- extensive I/O devices
- 3 SBX multi-module positions
- one multi-bus slot

There are three main routes for data in this system: ROM, RAM, and the I/O sections. ROM contains a pre-programmed set of instructions for the operation of the monitor. EEROM allows permanent retention of non-volatile data. CMOS RAM (which also contains configuration data) allows data retention in case of power failure or ON/OFF activation. Access to memory is obtained through address and data latches.

Dynamic RAM (DRAM) is used for temporary storage of data awaiting further manipulation. It is accessed by sending an address to the address DRAM controller and then waiting for data to be sent or received from the proper address or location in RAM. Data flow in or out is controlled via read and write latches by ARDC or 80186 arbitration. A parity generator is included within this circuitry to detect errors in stored data.

The I/O section contains four parts: iSBX* controller, multi-bus controller, SDLC controller, and several miscellaneous devices listed in the following discussion. The iSBX* controller allows interfacing of the address/data control bus through three connectors with the ability to add future iSBX* modules currently used by PC Mode components (optional). The multi-bus controller allows interfacing of the address/data bus through two connectors to the display controller and the multi-bus. The SDLC controller allows data communication with the patient input modules, bedside recorder (optional) or Remote Module Housing (optional).

The CPU board contains a rear panel SDLC connector for connection of an External Module, a Flexport, a Bedside Recorder, or Telemetry Receiver Housing.

* iSBX® is a protocol designed by Intel

Other devices of the I/O section include: eight on-board LEDs used for diagnostics, the infrared touch screen controller, a sound generator that includes a speaker amplifier to produce various programmed alarms, a serial interface DUART to provide interfacing for an optional IBM PC/XT compatible keyboard, a modem/DTE configurable RS-232C port, and a real-time clock that operates from the lithium battery in the event of a power failure or manual monitor power off. The DUART has two ports:

1. RS232
2. keyboard and/or Infrared Remote Control

CPU 80186

Interrupt Controller: 8259

- Primary control for the monitor
- Interrupt-driven architecture

Communications

Synchronous Data Link Control (SDLC)

- Controlled by the PRIMARY SDLC RUPI
- Interfaces monitor to:
  - Internal Modules
  - External Modules (via module housings)
  - Bedside Printer
  - Telemetry Processors
  - FlexPort (all models)
  - PCMS/600 Interface (model 90422)

Ethernet

- Controlled by the 82586 ETHERNET CONTROLLER and MANCHESTER ENCODER.
- Interfaces the monitor to ALL other Networked devices.

iSBX (Small Bus Interface)

- Interfaces monitor to:
  - Dual Serial (RS232c) Port Card
  - Parallel Port Card
  - Disk Drive Controller Card

RS232c (J8)

- Controlled by Dual UART (DUART)
- Interfaces monitor to:
  - Large Screen Remote Monitor
  - PC Mode
  - Terminal Emulation Mode

Multi-bus

- Interface to the Display Controller board

Controllers

IRTS (Infrared Touchscreen)

RUPI

- Controls strobing of the Infra-Red LED/Detectors
- Reports to CPU (80186) the co-ordinants of blocked Emitter/ Detector Pairs

Sound Generator

- Produces a variety of tones at various volume levels
- Serves as Status Port for +5V and Lithium Battery

DUART

- Configurable RS232c Port (J8)
- Serial port for the IBM-style Keyboard (PC Mode)

Real Time Clock

- Maintains monitor's Time and Date
- Backed up by the lithium Battery

Memory

- Read Only Memory (ROM)
- Up to 5 banks of 256K each in ROM pack
- Contains operating instructions and data for the CPU

E2ROM

- 2K x 8
- Contains purchased options configuration
- Programmable through SpaceLabs Medical' Service Representatives only

Dynamic Random Access Memory (DRAM)

- 6 banks of 256K each
- Functions:
  - Stores trend data for all active parameters
  - Stores waveform and text from modules for local display and/ or network
- Stores waveform and text received from the network
- Scratch pad RAM for CPU functions
- PC Mode operating system and software programs

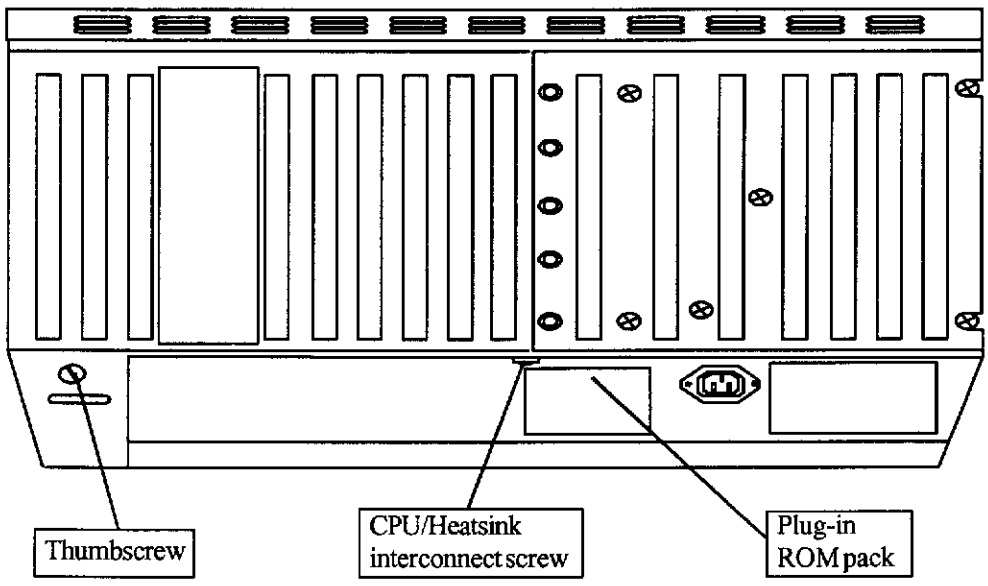
CMOS Static RAM

- 64K x 16
- Backed up by the lithium battery (VBACK)
- Maintains network configurations
  - Node ID
  - Node name
  - Primary/ Secondary recorder defaults
  - Subnet name
- Maintains local configurations
  - Central/bedside
  - 600/telemetry bednames (Central only)
  - Serial port assignments
  - Screen formatting (Central only)
  - Remote access on/off
- Maintains: Installed Options
  - Refer to models, options, configurations for a complete listing.
- Also Maintains
  - Error log
  - Screen formatting (Central only)
  - Record alarmed parameters

CPU Disassembly

1. Power down the monitor and remove the power cord from the back panel.

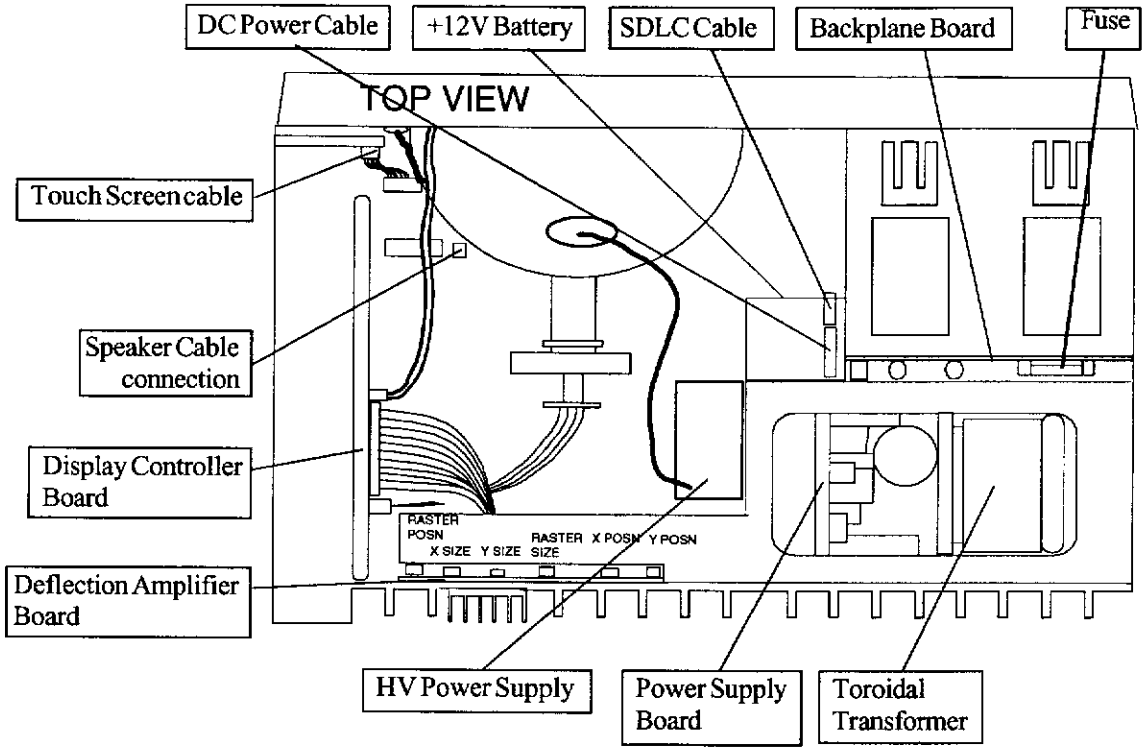
2. Remove the plug-in ROM pack.



3. Remove the 12-volt battery.

4. Disconnect all cables from the Display Controller board, and remove it.

5. Remove the SDLC cable.



6. Remove the DC power cable.

7. Remove the Touch Screen cable.

8. Remove the Speaker cable.

9. If present, remove the screw that interconnects the CPU drawer with the heatsink (see the previous illustration).

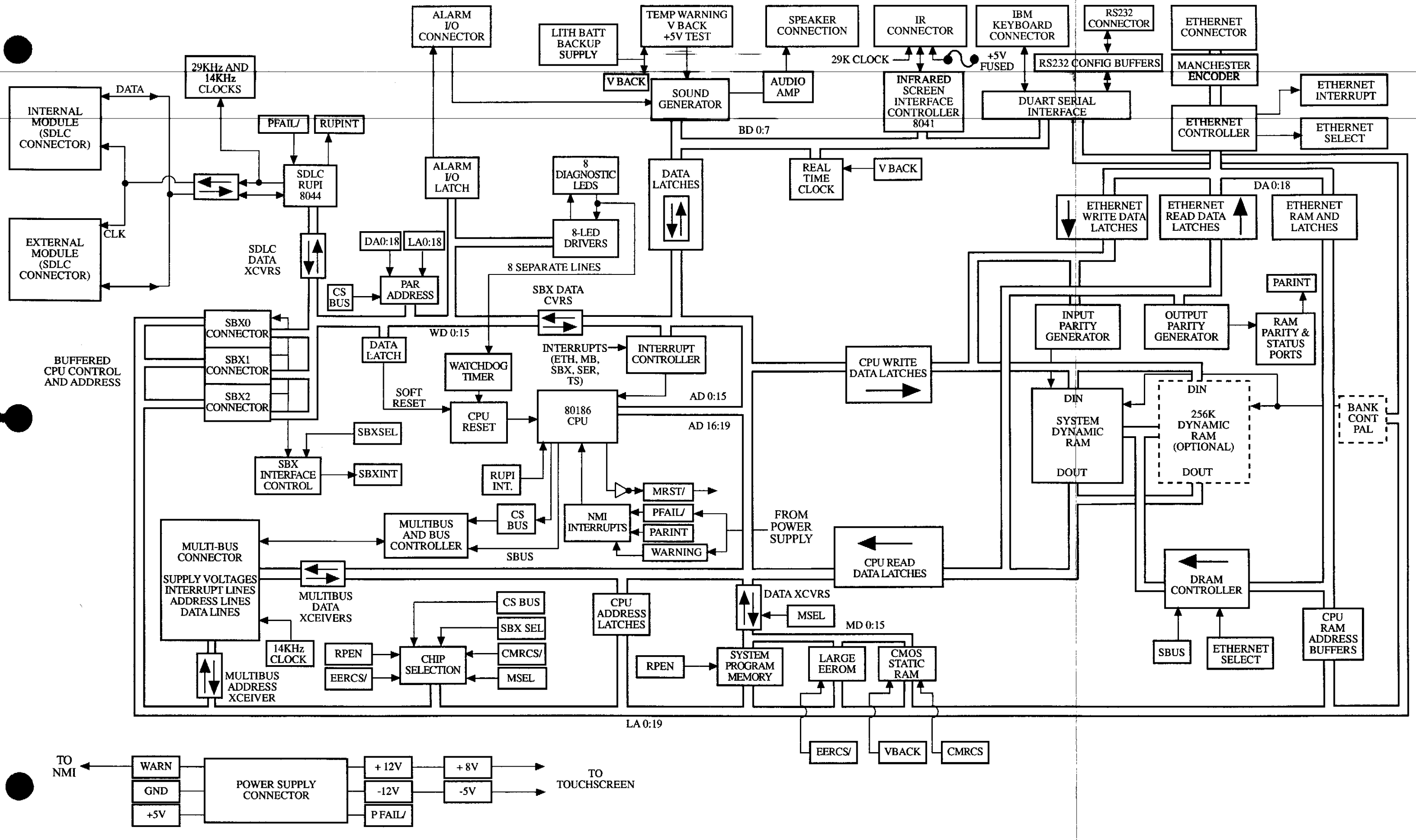
10. Loosen, but do not remove, the thumb screw located above the back panel LED viewing slot (see the previous illustration).

11. Slide out the CPU drawer assembly from the rear of the monitor.

Replacing CMOS Lithium Batteries

CMOS batteries should be replaced every 2 to 3 years.

1. Turn off power to the Monitor.
2. Remove the CPU Drawer/CPU Assembly.
3. Within 20 seconds, remove the old lithium battery from its holder, and install the new battery.
4. Re-install the CPU Drawer/CPU Assembly and the Monitor cover.
5. Turn on AC power.
6. Reconfigure the monitor via the BIOMED menu and SYS-GEN.



070-0061-02

CPU BLOCK DIAGRAM

Troubleshooting Procedures

These troubleshooting steps use the following board references:

A1	CPU Board	A7	Touchscreen Assembly
A2	Display Controller Board	A8	ROMpack
A3	X-Y Deflection Board	A9	AC Miscellaneous board
A4	Ethernet Interface Board	A10	High Voltage Power Supply Board
A5	Power Supply Board	A11	AC Switch Board
A6	Module Backplane Board		

Step	Condition	If OK, go to . .	If not OK, go to. . .
1.0	Blank display		
1.1	Remove monitor cover and view status LED on CPU board for 30 seconds.		
	a) LEDs blink	Step 1.4	Step 1.1b
	b) LEDs steady	Step 1.4	Step 1.1c
	c) LEDs flash randomly	Step 1.6	Step 1.1d
	d) LEDs off	Step 1.6	

Note:

Normal LED display after power-up diagnostics complete shows random flashing at half intensity. Error LED display shows blinking or steady state code at full intensity. Be sure the ROM pack is fully seated.

1.2	Measure +5VDC at top right (component side) of display controller marked +5V. For ground, use TP GND	Step 1.3	Adjust R160 on A5 for +5.15 VDC at TP4. If cannot adjust, replace A5.
1.3	Measure the following voltages on the Power Supply board (A5):		
	a) +58 VDC at TP2	Step 1.3b	Replace A5, A9
	b) +25 VDC at PIO2, pin 10	Step 1.3c	"
	c) +18 VDC at C330 (+)	Step 1.3d	"
	d) +12 VDC at TP3	Step 1.3e	"
	e) +8 VDC at P102, pin 16	Step 1.3f	"
	f) +5 VDC at TP4	Step 1.3g	"
	g) -5 VDC at P102, pin 4	Step 1.3h	"
	h) -8 VDC at P102, pin 12	Step 1.3i	"
	i) -12 VDC at P102, pin 17	Step 1.3j	"
	j) -25 VDC at P102, pin 9	Step 1.3k	"

Note:

A failed display controller or X-Y deflection board can load or remove sync from the power supply board, causing an apparent power supply failure. Before replacing boards if voltage tests fail, unplug cable between the display controller (A2) and the X-Y deflection (A3) or the yoke connector or cable between X-Y deflection and A5. If voltages return to normal or greater, replace A2 or A3.

Step	Condition	If OK, go to . .	If not OK, go to. . .
1.4	LEDs steady CPU LEDs as viewed from rear of monitor.		
	Measure +5 VDC at power supply connector at P19, pins 8 and 9.	Replace CPU	Step 1.2
REMINDER: Reseat boards and connectors. Retest before proceeding.			
1.6	LEDs blank At power-up LEDs light, then go blank.	Replace A8, then A1	Step 1.2
2.0	No module parameters displayed Only PRESS, TEMP, and SpO2 require their transducers to be plugged into the monitor to display their respective parameter keys. SvO2, NIBP, Cardiac Output, and Flexports will display their parameter keys without any cable connection.		
2.1	Reseat suspect module in different slot - parameters display		Refer to module technical manual
3.0	Incorrect Waveforms Verify checkout procedures - waveforms correct		Refer to module technical manual
4.0	Incorrect Functions Manipulate all keys, alarms, etc. - functions and alarms OK		Replace in order: A8, A1, A2

Troubleshooting Procedures

Test-Failure Codes

If the ROM pack is not properly seated, the LEDs will remain on continuously.

CPU LEDs as seen through the LED viewing slot
(LEDs steady ON)

LSB							MSB	Hex	Description
●	○	○	○	○	○	○	○	01	Replace A8
○	●	○	○	○	○	○	○	02	Replace A8
●	●	○	○	○	○	○	○	03	Replace A8
○	○	●	○	○	○	○	○	04	Replace A8
●	○	●	○	○	○	○	○	05	Replace A8
○	●	●	○	○	○	○	○	06	Replace A1
●	●	●	○	○	○	○	○	07	Replace A8
○	○	○	●	○	○	○	○	08	Replace A1
●	○	○	●	○	○	○	○	09	Replace A1
○	●	○	●	○	○	○	○	0A	Replace A1
●	●	○	●	○	○	○	○	0B	Replace A1
○	○	●	●	○	○	○	○	0C	Replace A1
●	○	●	●	○	○	○	○	0D	Adj R150. Replace A1 battery, A1, A5, A9
○	●	●	●	○	○	○	○	0E	Adj R150. Replace in order A5, A9, A1
●	●	●	●	○	○	○	○	0F	Replace A1
○	○	○	○	●	○	○	○	10	Replace A1
●	○	○	○	●	○	○	○	11	Warning only. Verify CMOS data contents.
○	●	○	○	●	○	○	○	12	Retest. If failed, replace A1
●	●	○	○	●	○	○	○	13	Replace A1
○	○	●	○	●	○	○	○	14	Warning only. Retest. If failed, replace A1.
●	○	●	○	●	○	○	○	15	Replace A1
○	●	●	○	●	○	○	○	16	Retest. If failed, replace A1
●	●	●	○	●	○	○	○	17	Replace A1
○	○	○	●	●	○	○	○	18	Replace A1
●	○	○	●	●	○	○	○	19	Replace A1
○	●	○	●	●	○	○	○	1A	Replace in order A2, A1
●	●	○	●	●	○	○	○	1B	Replace in order A1, Touchscreen
○	○	○	○	●	○	○	○	1C	Replace in order A1, Touchscreen
●	○	●	●	●	○	○	○	1D	Replace in order A1, Touchscreen
○	●	●	●	●	○	○	○	1E	Replace in order A1, Touchscreen
●	●	●	●	●	○	○	○	1F	Replace A8, A1
○	○	○	○	○	●	○	○	20	Replace in order A1, A5
●	○	○	○	○	●	○	○	21	Replace in order A1, A6
○	●	○	○	○	●	○	○	22	Replace A1
●	●	○	○	○	●	○	○	23	Replace A1
○	○	●	○	○	●	○	○	24	Replace in order Ethernet chip, A1
●	○	●	○	○	●	○	○	25	Replace in order touchscreen assembly, A1
○	●	●	○	○	●	○	○	26	Replace A1
●	●	●	○	○	●	○	○	27	Retest. If failed, replace A1.
○	○	○	●	○	●	○	○	28	Retest. Replace in order A1, A8
●	●	●	●	●	●	●	●	XX	Screen Blank. PROM not properly seated

Error Codes

As a part of troubleshooting the Patient Care Management System patient Monitors are equipped with an Error Logger. This Error Logger records the results of Soft Resets caused by interruptions to processing. These logged errors can be used in troubleshooting operational problems down to suggested hardware assembly levels.

Before using this troubleshooting technique make sure that all other procedures have been followed including elimination of operator errors, testing of voltages, correction of display faults, diagnostic testing, cabling/connector repairs, software compatibility, etc..

Types of Errors

There are two types of Error Codes generated by PCMS Monitors:

1. Recoverable (only on PC2 monitors)
2. Non-recoverable

Recoverable errors will not be discussed in this manual.

Non-Recoverable Errors

Non-recoverable errors involve a condition where the CPU requires a reset to recover. Two types of resets can occur:

1. Soft Reset - The microprocessor resets, but only a portion of power-on diagnostics are executed. The contents of RAM are maintained, so patient monitoring is only interrupted for the period of the reset. This reset can take up to 30 seconds. As a result of this reset, a non-recoverable error is logged.

2. Cold Start - The cold start has the same effect as cycling power to the monitor. The microprocessor resets and the complete set of power-on diagnostics are performed. The contents of RAM are rewritten by the RAM diagnostics performed as part of the power-on diagnostic testing. No error codes are generated or logged during a cold start. Module data stored in the monitor will be lost.

A single occurrence of an error code may not indicate a hardware failure. Error codes are best used as a diagnostic tool monitored over a period of time. For multiple occurrences of the same error code, refer to the error list at the end of this section for possible causes.

Error codes not mentioned in this document are not used in trouble shooting equipment problems.

The following pages document how to read the error log for PC1 Monitors. In addition, a list of all usable codes and their **probable** cause(s) is included.

Decimal/Hexadecimal Code

DEC	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20

Accessing and Reading CMOS Error Codes

1. Enter the Diagnostics menu by powering up the unit while holding your index fingers in the bottom corners. Keep your fingers in place until the Diagnostic menu appears.

2. Select item 1 (Display Patterns or memory) and then item 5 (CMOS Display).

3. Use the "PAGE DOWN" key (at the bottom left of the screen) and page down to the last page.

Here is an example of a typical last-page screen display of the CMOS Error Log.

```
A0F0  00000004000000000000000000010000  ................
A0F1  00000000000000000000000000000000  ................
A0F2  00000000000000000000000000000000  ................
A0F3  00000000000000000000000000000000  ................
A0F4  00000000000000000000000000000000  ................
A0F5  00000000000000000000000000000000  ................
A0F6  00000000000100000000000000000000  ................
A0F7  00000000000000000000000000000000  ................
A0F8  00000000000000000000000000000000  ................
A0F9  00000000000000000000000000000000  ................
A0FA  00000000000000000000000000000000  ................
A0FB  00000000000000000000000000000000  ................
A0FC  00000000000000000000000000000000  ................
A0FD  00000000000000000000000000B0000   ................
A0FE  00000000000000000000000000000000  ................
A0FF  00005555030065005DDEF6015F9E5F64  ................

 PAGE DOWN        PRESS SIDES TO EXIT     PAGE UP
```

At the bottom of the last page, line A0FF contains the last error code that occured as well as the total number of errors logged SINCE CMOS WAS LAST CLEARED. Following are examples of how to interpret line A0FF.

Example 1:

This is the way a typical A0FF line may look:

A0FF 00005555030065005DDEF6015F9E5F64

Break the line into groups of four;

A0FF 0000/5555/0300/6500/5DDE/F601/5F9E/5F64

Invert the 3rd and 4th groups:

03 00 invert to 00 03
65 00 invert to 00 65

Read as: Total errors logged = 3
Last error logged = 65

Example 2:

A0FF 00004F160C0003006CDF1A0F5FAD5F42

Break the line into groups of four;

A0FF 0000/4F16/0C00/0300/6CDF/1A0F/5FAD/5F42

Invert the 3rd and 4th groups :

0C 00 invert to 00 0C
03 00 invert to 00 03

Read as: Total errors logged = 0C (HEXADECIMAL) = 12 (DECIMAL)

Note:

For Hexadecimal to Decimal conversion use the table at the beginning of this section

---

Last error logged = 03

Finding Specific Error Codes

To find specific error codes, use the "Page Up" key once to go back one page. Read the lines A0E0 through A0FD (on the next-to-last page) and note the errors. The errors listed here give you the error code and the number of times that particular error occured SINCE THE CMOS WAS LAST CLEARED.

Here is an example of a typical second-to-last-page screen display of the CMOS Error Log.

```
A0E0  00000004000000000000000000010000 ................
A0E1  00000000000000000000000000000000 ................
A0E2  00000000000000000000000000000000 ................
A0E3  00000000000000000000000000000000 ................
A0E4  00000000000000000000000000000000 ................
A0E5  00000000000000000000000000000000 ................
A0E6  00000000000100000000000000000000 ................
A0E7  00000000000000000000000000000000 ................
A0E8  00000000000000000000000000000000 ................
A0E9  00000000000000000000000000000000 ................
A0EA  00000000000000000000000000000000 ................
A0EB  00000000000000000000000000000000 ................
A0EC  00000000000000000000000000000000 ................
A0ED  00000000000000000000000000B0000 ................
A0EE  00000000000000000000000000000000 ................
A0EF  00000000000000000000000000000000 ................

 PAGE DOWN     PRESS SIDES TO EXIT        PAGE UP
```

The following examples illustrate how this screen is interpreted.

A typical line of the screen may be displayed as seen below:

A0E0 00000004000000000000000000010000.....

Break the line up into groups (columns) of 2 and give the columns hexadecimal values:

```
          0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F

A0E0      00 00 00 04 00 00 00 00 00 00 00 00 00 01 00 00
```

The last digit of the ROW number (A0E*0*) is the first digit of the error code (=0).

```
          0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F

A0E*0*    00 00 00 04 00 00 00 00 00 00 00 00 00 01 00 00
```

The Hexadecimal value of the COLUMN is the second digit of the error code (=3).

	0	1	2	***3***	4	5	6	7	8	9	A	B	C	D	E	F
A0E0	00	00	00	04	00	00	00	00	00	00	00	00	00	01	00	00

The decimal value in the COLUMN is the number of times the error occurred (=4).

	0	1	2	***3***	4	5	6	7	8	9	A	B	C	D	E	F
A0E0	00	00	00	***04***	00	00	00	00	00	00	00	00	00	01	00	00

Therefore the error was 03 and it occurred 4 times; or, there were four-03 errors.

Note that there is a second error on this line. Using the same technique as above we find that it occurred once.

	0	1	2	3	4	5	6	7	8	9	A	B	C	***D***	E	F
A0E0	00	00	00	04	00	00	00	00	00	00	00	00	00	***01***	00	00

Reading the rest of the page gives error codes of:

One - 65 error

B (Eleven) - DD errors

Note:

For Hexadecimal to Decimal conversion use the table at the beginning of this section

---

To clear CMOS place one finger in the left-hand lower corner of the screen and move another finger from left to right across the bottom of the screen.

Error Codes and Probable Causes

ERROR	DESCRIPTION/PROBABLE CAUSE
0000	No troubleshooting value
0001	VRTX Task ID Error/ Rompack
0002	VRTX No TCB's Available/ Rompack
0003	VRTX No Memory Available/ Software
0004	VRTX Not A Memory Block/ Rompack
0005	VRTX Mailbox In Use/ Rompack
0006	VRTX Zero Message/ Rompack
0007	VRTX Buffer Full/ Rompack
0008	VRTX WaitC In Progress/ Rompack
0009	VRTX Invalid System Call/ RAM PCBA
000A	VRTX Time Out / CPU Board
000B	VRTX No Message Present/ Rompack
000C	VRTX Queue ID Error/ Rompack
000D	VRTX Queue Full/ Software
000E	VRTX Partition ID Error/ Rompack
000F	VRTX Initialization Error/ Rompack
0010	VRTX No Charactor Ready/ Rompack
0011	No troubleshooting value
0012	No troubleshooting value
0013	Divide by Zero/Rompack,CPU,Software
0014	No troubleshooting value
0015	Overflow Interrupt/Rompack, CPU
0016	Array Interrupt/Rompack CPU
0017	Bad Opcode/Rompack,CPU,Software
0018	No troubleshooting value
0019	No troubleshooting value
001A	No troubleshooting value
001B	No troubleshooting value
001C	No troubleshooting value
001D	No troubleshooting value
001E	No troubleshooting value
001F	Bad Packet Length/ CPU Board, Module, Terminator
0020	Bad SDLC Address/ CPU Board, Modules, Terminator
0021	Bad Packet Code/ CPU Board, Modules, Terminator
0022	Bad Instruction In Kernal/ CPU Board, Ram PCBA, Rompack, Modules
0023	No troubleshooting value
0024	No troubleshooting value
0025	No troubleshooting value
0026	Bad Dictionary Header/ Module Software
0027	Bad Secondary Header/ Module Software
0028	Interpreter Invoked With Bad Module Channel/Module Software
0029	Bad Packet Type Received-Interpreter/ CPU Board, Ram PCBA, Rompack

ERROR	DESCRIPTION/PROBABLE CAUSE
002A	Bad SDLC Address- Interpreter/ CPU Board, Ram PCBA, Rompack
002B	Bad Channel Number- Interpreter/ CPU Board,Ram PCBA, Rompack
002C	Bad Program Index /Module, CPU Board,Ram PCBA, Rompack
002D	QPEND Error In Tx Task - Interpreter /Module, CPU Board, Ram PCBA, Rompack
002E	Rx Buffer Unavailable Excessive SDLC Loading/CPU Board/Software
002F through 0036 - No troubleshooting value	
0037	Cannot Accept Parse Table Structure/ Module Problem
0038 through 0042 - No troubleshooting value	
0043	Parity Error/Rompack,CPU
0044	Alarm Or Record Called With Invalid Mod/Channel/ CPU Board,Ram PCBA, Rompack
0045	No troubleshooting value
0046	No troubleshooting value
0047	No troubleshooting value
0048	No troubleshooting value
0049	No troubleshooting value
004A	No troubleshooting value
004B	Eth_Node_Dir_Resp Expected/ CPU Board,Network Problem/Cabling
004C	Eth_Module_Ch_Dir Expected/ CPU Board,Network Problem/Cabling
004D	Eth_Attach_Channel_Resp Expected/ CPU Board, Network Problem/Cabling
004E	Eth_Enable_Alarm_Resp Expected/ CPU Board,Network Problem/Cabling, Rompack
004F	Unknown Return Status/ CPU Board,Network Problem/ Cabling
0050	Node Directory Length Error/ CPU Board,Network Problem/Cabling
0051	Next Level Link Does Not Match Table Size/CPU Board, Ram PCBA, Rompack
0052	No troubleshooting value
0053	Memory Manager Failed SDLC Loading/ CPU Board,Ram PCBA, Rompack
0054	No troubleshooting value
0055	No troubleshooting value
0056	No troubleshooting value
0057	No troubleshooting value
0058	Ascii Table Index Out Of Range/ Module Problem
0059	No troubleshooting value
005A	No troubleshooting value
005B	No troubleshooting value
005C	No troubleshooting value
005D	No troubleshooting value

ERROR	DESCRIPTION/PROBABLE CAUSE
005E	Rx Interprter Buffer Full/ SDLC Loading, Software, CPU Board, Ram PCBA, Rompack
005F	No troubleshooting value
0060	Bad Channel Number Was Found In A Packet/ Software
0061	Bad Module Number Was Found In The Packet/ Software
0062	SDLC Initial. Error/CPU Board, Module
0063	SDLC Intr. Sequence Error/ CPU Board
0064	Invalid Final Packet/ Module Problem
0065	RUPI Error Case/ CPU Board, Module
0066	SDLC Tx Buffer Overflow/ CPU Board
0067 through 006E - No troubleshooting value	
006F	User Reset Via Biomed Menu/ Operator Initiated
0070	No troubleshooting value
0071	No troubleshooting value
0072	No troubleshooting value
0073	No troubleshooting value
0074	No troubleshooting value
0075	No troubleshooting value
0076	Init Loop Error/Software, Display Controller
0077	No more Display Buffers/Software
0078	No troubleshooting value
0079	No troubleshooting value
007A	No troubleshooting value
007B	No troubleshooting value
007C	No troubleshooting value
007D	Display Interrupt Lost/ Disp. Controller, CPU Board
007E	No troubleshooting value
007F	No troubleshooting value
0080	No troubleshooting value
0081	No troubleshooting value
0082	No troubleshooting value
0083	No troubleshooting value
0084	No troubleshooting value
0085	Close Link Error/ Software
0086	Open Link Error/ Software
0087	No Such Channel/ CPU Board
0088	No troubleshooting value
0089	No troubleshooting value
008A	No troubleshooting value
008B	No troubleshooting value
008C	No troubleshooting value
008D	Invalid Message Type/Network Cabling, Fanouts
008E	Illegal Lcn/ CPU Board
008F	No troubleshooting value
0900	No troubleshooting value
0901	No troubleshooting value
0902	No troubleshooting value
0903	No troubleshooting value
0904	No troubleshooting value

ERROR	DESCRIPTION/PROBABLE CAUSE
0905	No troubleshooting value
0096	Bad Decnet Node ID/ CPU Board
0097	Config Data Base Error/ CPU Board
0098	Multicast Enable Request Failed/ CPU Board
0099	Config Sent Msg Qpost Error/ CPU Board
009A	Config Return Status Error/ CPU Board
009B	No troubleshooting value
009C	No troubleshooting value
009D	No troubleshooting value
009E	No troubleshooting value
009F	No troubleshooting value
00A0	Mfree Error/Software
00A1	No troubleshooting value
00A2	No troubleshooting value
00A3	No troubleshooting value
00A4	No troubleshooting value
00A5	No troubleshooting value
00A6	Out of 32 byte VRTX mem/Software
00A7	No troubleshooting value
00A8	No troubleshooting value
00A9	No troubleshooting value
00AA	82586 Receive Error/ CPU Board,Network Problem/ Cabling
00AB	Lost Ethernet Interrupt/ CPU Board, Network Problem/ Cabling
00AC	No troubleshooting value
00AD	82586 Hung/ CPU Board,Network Problem/Cabling
00AE	No troubleshooting value
00AF	Msg Rcvd. In Routing With Zero Use Count/ CPU Board
00B0 through 00C7 - No troubleshooting value	
00C8	Unrecognized Message to NSP/Software
00C9	Feature Not Yet Supported Called From IBM Net/ Software, CPU Board
00CA	Bad DEC Net Msg Called From IBM Net/Software, CPU Board
00CB	Lost Ncb Cmd Ptr/ Software,CPU Board
00CC	Lost Lcn/ Software, CPU Board, Ram PCBA
00D6	Invalid Opcode/ Rompack
00D7	No troubleshooting value
00D8	No troubleshooting value
00D9	No troubleshooting value
00CD through 00D5 - No troubleshooting value	
00DA	Invalid Tss/ RAM PCBA, Rompack
00DB	Segment Not Present/ RAM PCBA, Rompack
00DC	Stack Segment Error/ RAM PCBA, CPU Board
00DD	Gen. Protect Fault/ Software (1)Monitor (2) Module
00DE	Page Fault/ Rompack, RAM PCBA
00FA	Undefined Interrupt/Rompack,CPU Board
00FF	Eth_Alarm Multicast Receive Error/ CPU Board

ERROR	DESCRIPTION/PROBABLE CAUSE
0100	Not Enough Ram For V86/ Not Enough Ram Installed
0101	Init Page Table Error/ RAM PCBA
0102	No troubleshooting value
0103	Invalid Descriptor To Free/ RAM PCBA
0104	No troubleshooting value
0105	Invalid 80386 Exception/ Rompack
0106	No troubleshooting value
0107	No Stack For Task/ Software
0108	No troubleshooting value
0109	No troubleshooting value
010A	Ts Rcv Pkt Err/ Touchscreen, Display Controller,CPU Board
010B	Ts Xmit Packet Too Big/ Touchscreen, Display Controller, CPU Board
010C	VRTX blk Overflowed Bufmem/ CPU Board
010D	Invalid Rbint Request/ CPU Board
010E	Bad Ether Physaddr/ CPU Board, Ram PCBA, Rompack
010F	Watchdog Reset Error/ Software, CPU Board
0110	Bad Monitor Type/ Verify Dip Switch Settings
0111	Olr Expected IBM Net/ CPU Board
0112	No troubleshooting value
0113	Bad DECNet Msg/ CPU Board
0114	Lost NCB Cmd Ptr/ CPU Board
0115	No troubleshooting value
0116	No troubleshooting value
011N	Bad Msg Ptr/ RAM PCBA
0118	DMA Use Error/ RAM PCBA
0119 through 012B - No troubleshooting value	
012C	Bad Magic Number In gap Code/ Rompack
012D	No troubleshooting value
012E	Dgisinit Could Not Find Working Display Board/Display Controller
012F	No troubleshooting value
0130	34010 Won't Start Up After Loading/DisplayController
0131	Display Controller Stopped Rcv Waveform Data/Display Controller
0132 through 01C7 - No troubleshooting value	
01C8	Shared Table Database Corrupted/ RAM PCBA
01C9 through 01F3 - No troubleshooting value	
01F4	CR child TID/QID Table Is Corrupted/ RAM PCBA
01F5	Got Bad Open Link Response/ CPU Board
01F6	No troubleshooting value
01F6 through 0257 - No troubleshooting value	
0258	CAagent TID/QID Table Is Corrupted/ RAM PCBA
0259	Got Bad Open Link Response/ CPU Board
0260 through FFFF - No troubleshooting value	

Periodic Maintenance

Periodic maintenance checks should be performed approximately every 180 days. The following steps describe the necessary procedure.

1. Clean monitor filter (located underneath monitor, directly below plug-in modules). Remove filter from the monitor (held by four screws) and wash with water and mild soap. Make certain the filter is completely dry before reinstallation. Do not substitute foam as filter material, as air cannot easily pass through. Patient input module overheating and possible permanent equipment damage may result if foam is used.

2. Remove touchscreen assembly and clean face of CRT, if required.

3. Perform the safety verification tests previously described.

4. Carefully observe operation of the monitor and any active patient input modules. If necessary, run functional tests to verify monitor performance.

5. Visually check for accuracy of display intensity and clarity.

6. Test the ambient light sensor by alternately covering and exposing the sensor. The display brightness should vary with each change.

Section 4: Options

Patient Data Logger

Overview

The Patient Data Logger (PDL) is a software option to SpaceLabs Medical's PC Bedside patient Monitor (Model 90303B). PDL transmits patient vital signs data directly to compatible external devices, such as printers and terminals. Data is transmitted through one of the monitor's RS232 serial communications ports and is formatted onto a screen or printout as line-at-a-time images using standard ASCII characters.

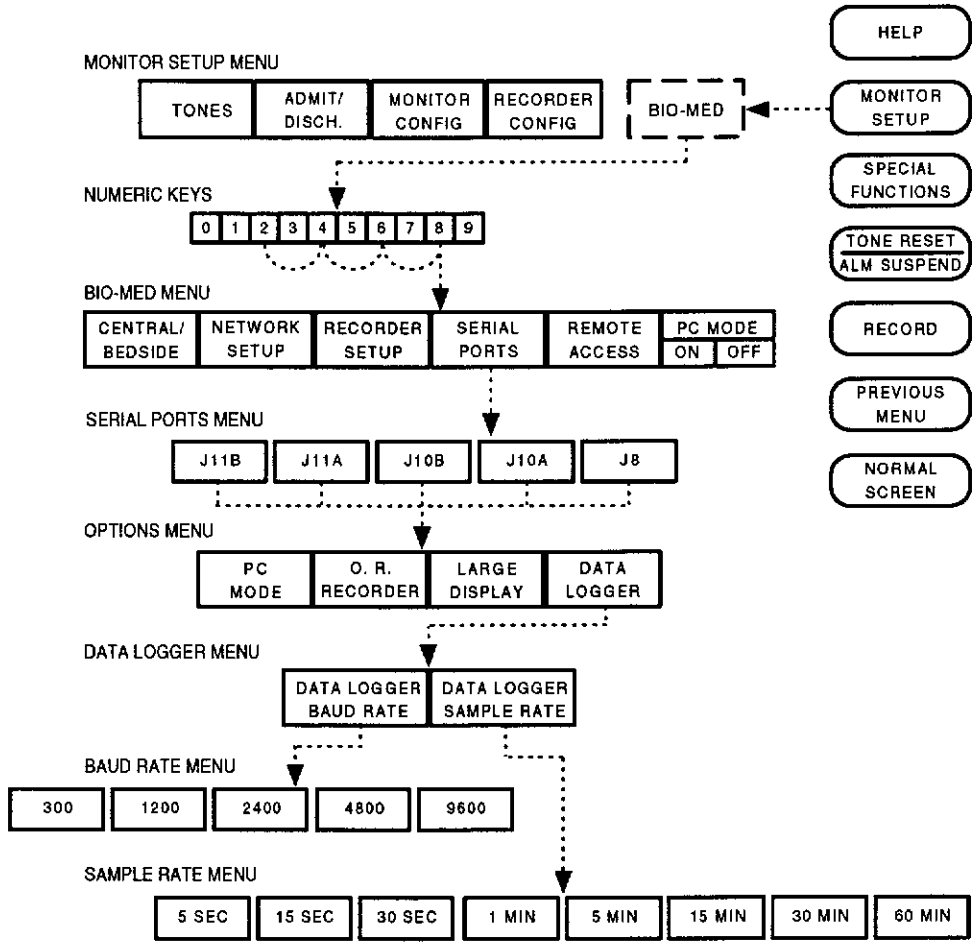
Note:

The PC Bedside Monitor is medical equipment. All cables, printers, and other computer equipment connected to the monitor must comply with applicable medical standards.

Accessing the Bio-Med Menu

1. Apply power to the monitor and allow it to complete the self-test routine.

2. Press the MONITOR SETUP hardkey to obtain the following Monitor Setup menu:



DEPENDING ON THE INSTALLED OPTIONS, NOT ALL MENUS WILL APPEAR AS SHOWN HERE.

3. Press the invisible Bio-Med key in the Monitor Setup menu. The monitor will display a set of numeric keys, which are used to enter the code number.

Note:

Authorized personnel can obtain the numeric code number from a hospital Biomedical Engineer or from SpaceLabs Medical.

---

4. Enter the code number. If an incorrect number is entered, the screen remains unchanged. If the correct number is entered, the Bio-Med menu will display.

5. Press the SERIAL PORTS key. The Serial Ports menu will display, where J8 represents the 25-pin port, and J10A/B and J11A/B represent the 9-pin ports of the Dual Serial Port Option. See "Connecting to an External Device" in this chapter for more information.

6. Select the desired serial port. The Options menu will display.

7. Press the DATA LOGGER key. The Data Logger menu includes options for setting the baud rate and the sample rate.

8. Press the DATA LOGGER BAUD RATE key to display the Baud Rate menu, and select the desired baud rate.

Note:

The combination of PDL baud rate and sample rate must be selected carefully. Slow baud rates, in combination with frequent data transmissions, may cause loss of data. This is especially true if a large number of patient vital signs data is being monitored. At the same time, some devices cannot accept data at high baud rates, so this may limit the range of sample rates at which your device can accept data readings from the monitor.

---

9. To return to the Data Logger menu to set the sample rate, press the PREVIOUS MENU key. The Data Logger menu will display again.

10. Press the DATA LOGGER SAMPLE RATE key to display the Sample Rate menu, and select the desired sample rate.

11. Using the power switch on the monitor, turn the monitor OFF and then back ON. This procedure loads the configuration memory information into memory and restarts the monitor. The monitor will again go through the self-test routine.

Data Printouts

Each line of the data printout may contain up to 132 characters and is terminated with line feed and carriage return characters. Note that if you are monitoring a large number of parameters and you have an 80-column printer, the data from one reading may require more than one line. This will be handled automatically by the printer if it has a wrap-around feature. If you prefer that each data reading all fits on one line, try condensing the printer's type or using a wide carriage (132 column) printer.

Two types of information are transmitted: page headers and data lines. The page header appears at the top of each page and contains the patient name, bed number, and date. A new page is generated when the following situations occur:

- the end of a page is reached (i.e., 50 data lines have been transmitted)
- monitored vital signs parameters change
- patient name or bed number changes
- current date changes

Data lines are transmitted at the interval specified at configuration. Each data line contains the time that data was collected as well as the data collected for each vital sign parameter being monitored.

Troubleshooting

Problem	Possible Causes	Solution
DATA LOGGER key does not appear in Monitor Setup menu.	Monitor not configured for the option.	Contact SpaceLabs Medical to configure monitor.
Improper spacing or double spacing.	PDL interface sends a carriage return/line feed sequence at each end-of-line. The external device may not be set up properly.	Set external device for "0" line feed.
No data is being displayed or printed on external device.	Power problem or faulty cables. Device may not be set up properly.	Check power and cables. Ensure that device is in "on-line" mode and that RS232 port requirements are satisfied. Check for RS232 compatibility at the monitor and the external device. Check monitor port assignments and port connections.
Garbled or lost data.	Faulty cable. Parity set improperly. Baud rate settings may be inappropriate.	Check cables. Verify baud rate and parity settings.

Terminal Emulation Mode

Terminal Emulation (TE) Mode is a software option to SpaceLabs Medical's PC Bedside and PC Central Patient Monitors (Models 90303B/90311B/90312B). TE Mode allows these monitors to be used as remote terminals to other computers, providing display of patient information. This option can be used with any system offering RS232 serial terminal access.

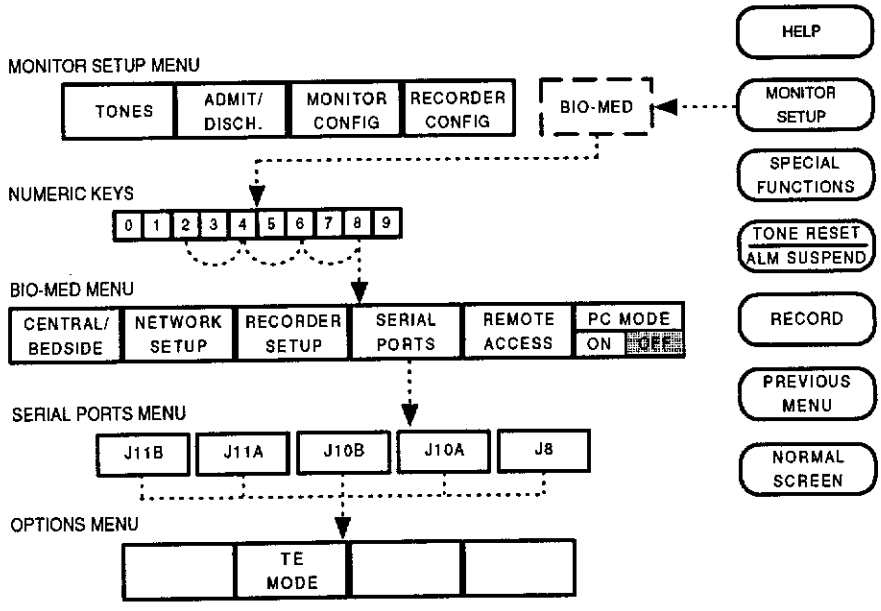
Monitors configured for TE mode use RS-232C communications and require the dedicated use of either the standard or one of the optional dual RS232 connectors on the back of the monitor. A keyboard (Model 90411) connects to the monitor for use in requesting information.

Note:

The PC Bedside and Central Monitor are medical equipment. It is your responsibility to ensure that any cables or other computer or communications equipment connected to the monitor comply with applicable medical standards.

Accessing the Bio-Med Menu

1. Apply power to the monitor and allow it to complete the self-test routine.
2. Press the MONITOR SETUP hardkey to obtain the Monitor Setup menu:



DEPENDING ON THE INSTALLED OPTIONS, NOT ALL MENUS WILL APPEAR AS SHOWN HERE.

3. Press the invisible Bio-Med key in the Monitor Setup menu. The monitor will display a set of numeric keys, which are used to enter the code number.

Note:

Authorized personnel can obtain the numeric code number from a hospital Biomedical Engineer or from SpaceLabs Medical.

---

4. Enter the code number. If an incorrect number is entered, the screen remains unchanged. If the correct number is entered, the Bio-Med menu will display.

5. After verifying that PC Mode is turned OFF, press the SERIAL PORTS key. The Serial Ports menu will display, where J8 represents the standard 25-pin serial port, and J10A/B and J11A/B represent the 9-pin ports of the Dual Serial Port Option. Pin-out diagrams are provided in "Connecting to an External Device".

6. Select the desired serial port. The Options menu will display.

7. Press the TE MODE key.

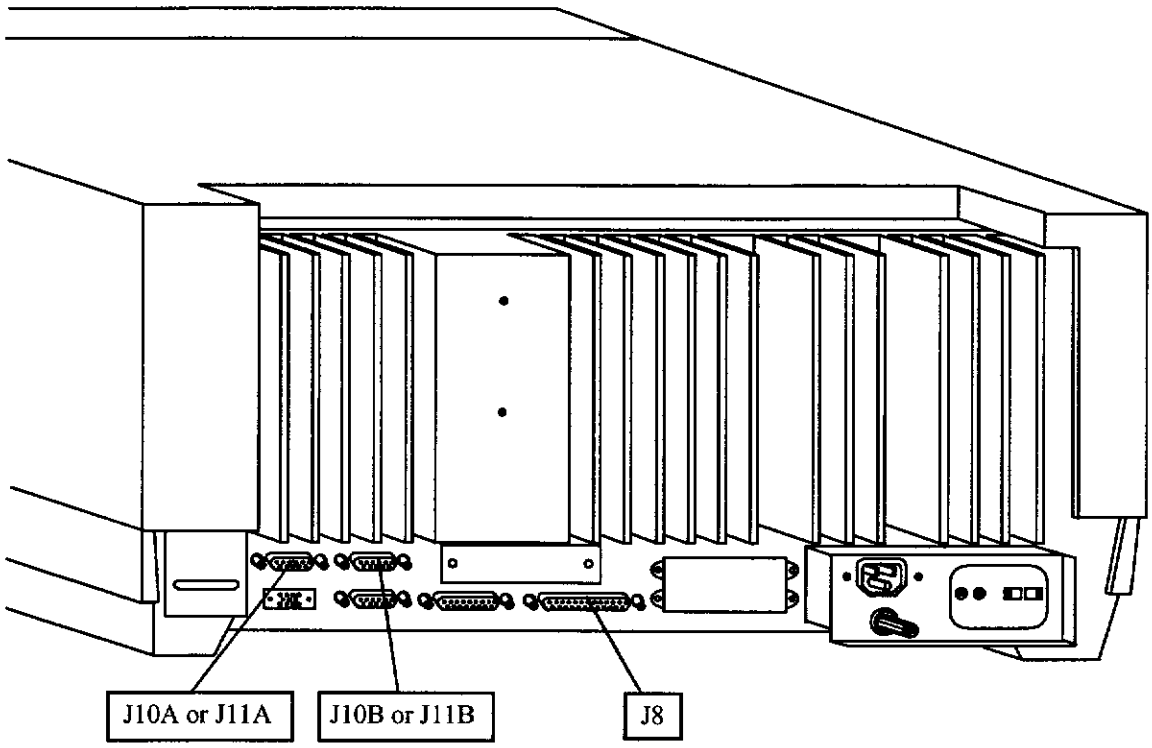
8. Using the power switch on the monitor, turn the monitor OFF and then back ON. This procedure loads the configuration memory information into memory and restarts the monitor. The monitor will again go through the self-test routine.

Troubleshooting

Problem	Possible Causes	Solution
TE Mode key does not appear in Monitor Setup menu.	Monitor not configured for the option.	Contact SpaceLabs Medical sales/service to configure monitor.
Garbled or lost data.	Faulty cable. Parity set improperly. Baud rate setting may be inappropriate.	Check cables.
No input characters are displayed in the TE Mode window.	TE Mode is off-line.	Check the Setup menu to verify that ONLINE has been set to YES.
Unreadable characters appear in the TE Mode window in place of text.	Communications settings are incorrect.	Check the baud rate, data bits per character, parity, and parity sense for your system and verify the Setup menu selections are set correctly.
Double characters or every other character prints.	Duplex is incorrect.	Change from half to full (or vice versa) on the Setup menu.
No carriage return - lines print in stairstep fashion.	Newline is set incorrectly.	Check the Setup menu to verify that NEWLINE is set to YES.

Connecting to an External Device

The PC Bedside Monitor comes with a 25-pin serial port designated J8. If you wish to send data to more than one external device at a time, a Dual Serial Port Option can be installed. This provides two additional serial ports, designated J11A and J11B, or J10A and J10B. See the figure below.



The cable used to connect the PC Bedside Monitor to an external serial device depends on the requirement of that device. Because RS232 hardware requirements vary, consult the operator's manual for the device to determine which interface cable to use.

To connect the monitor to an external device:

1. Connect the interface cable from the appropriate connector on the rear of the PC Bedside Monitor to the connector on the rear of the external serial device.

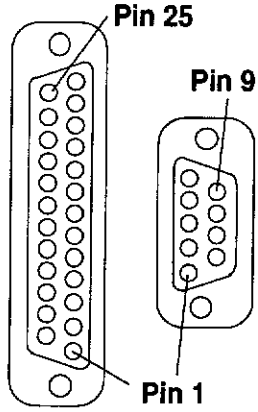
2. Turn power ON for the external serial device. When the PC Bedside Monitor is turned ON and data is being monitored, that data is transmitted to the receiving device. The data will print (or appear on the terminal screen) at the interval set for the sample rate.

3. If you wish to stop data transmission, turn the external device OFF. Do not set the printer off-line as this causes the printer to store the monitored data for printing when returned on-line.

Cable Pin-outs

The 25-pin serial port designated J8 and the Dual Serial Port option, designated J11A and J11B, or J10A and J10B, are wired as shown:

Connector	25-Pin	9-Pin (A)	9-Pin (B)
Chassis Ground	1	--	--
TX Output	2	3	3
RX Input	3	2	2
RTS Output	4	7	7
CTS Input	5	8	8
DSR Input	6	6	6
Signal Ground	7	5	5
SD Input	8	--	--
DTR Output	--	4	4
CD Input	--	1	1
RI Input*	--	9	9
DTR	20	--	--



* RI Input is installation-selectable for only one of the 9-pin ports (either A or B, but not both).

Additional Options

90303 PCMS Bedside Monitor (PC)

-01 PC Mode/Local Access

1. Access to patient data is limited to the local bedside monitor only.
2. Requires 90410 Disk Drive Module.
3. If parallel or additional serial peripheral devices are used, additional parallel or dual serial boards must be incorporated in the 90303(A)(B). See options -03 and -05 for the configuration of these boards.
4. Optional 90411 keyboard.
5. Monitor must be configured by your local customer service representative.
6. Use the Bio-Med menu to assign which serial ports belong to PC Mode, then use PIVOT software to assign COM1, COM2, etc. to those ports.

-02 PC Mode/Network Access

1. Access to patient data is available from all bedside monitors within the same LAN.
2. Requires 90410 Disk Drive Module.
3. One serial port (J8) is standard with the monitor. If parallel or additional serial peripheral devices are used, additional parallel or dual serial board(s) must be incorporated in the 90303(A)(B). See Options -03 and -05 for configurations of these boards.
4. Optional 90411 keyboard.
5. Monitor must be configured by your local customer service representative.
6. Use the Bio-Med menu to assign which serial ports are assigned to PC Mode, then use PIVOT software to assign COM1, COM2, etc. to those ports.

-03 Parallel Board

1. Allows for attachment of a single parallel device such as a printer.
2. Parallel boards can be installed in J10 or J11.
3. Two parallel ports (maximum) per monitor. If two parallel ports are installed, Options -04 and -05 are not possible.
4. Monitor must be configured by your local customer service representative.

-04 Analog Output

1. Provides hi-level analog waveforms from the installed modules.
2. Typical use is for the VIDCO remote display system.
3. Monitor must be configured by your local customer service representative.
4. If the VIDCO system is used, modules must be placed in specific slots, and pressures must have specific labels (ART, CVP, PA), etc. in those slots.

-05 Dual Serial Board

1. Allows for attachment of up to four (4) additional RS-232C (serial) ports, configured as DTE.
2. One RS-232C port (J8) comes with the 90303(A)(B) configured as DCE.
3. Up to two additional dual serial boards may be added for a maximum of five (5) RS-232C ports.
4. If two dual serial boards are installed, Options -03 and -04 are not possible.
5. Dual serial boards are installed in J10 or J11.
6. Monitor must be configured by your local customer service representative.
7. Serial port users are:
    a. PC Mode (See Option -01/-02).
    b. TE Mode (See Option -06).
    c. Data Logger (See Option -26).
    d. VIDCO Large Display (See Option -07).
8. Use the Bio-Med menu (serial ports) to assign users to the ports.

-06 Terminal Emulation

1. Provides a window on monitor's screen to display data from a host computer.
2. Requires 90411 keyboard.
3. Requires a dedicated RS-232C port, configured as DTE.
4. Not compatible with Option -01 or -02 (PC Mode).
5. Monitor must be configured by your local customer service representative.
6. Use the Bio-Med menu to assign the applicable serial port to TE Mode.

-07 PC-VIDCO RS-232C

1. Provides serial data out to dedicated RS-232C port for numerics on the VIDCO Remote Display.
2. Provides numerics only. Analog Output (Option -04) must also be installed.
3. Requires dedicated RS-232C port configured as DCE.
4. Monitor must be configured by your local customer service representative.
5. Cables required:
    a. Analog Output to SAU: 012-0058-XX
    b. RS-232C to SAU: 012-0060-XX (XX=cable length in feet)

-08 Six-Trace PC Monitor

1. Requires 3.50.xx (or above) software for entire network.
2. Requires 10MHz (20MHz XTAL) CPU, 26MHz display controller, and fast ROM Pack.
3. Monitor must be configured by your local customer service representative.

-10 Calcs and Tabular Trends

1. Data available only from the PC bedside monitor in which option is installed.
2. Requires 3.62.43EN (or above) software.
3. Requires 436-0009-01 CPU drawer assembly.
4. Provides the following calculations:
    a. Hemodynamic
    b. Oxygenation
    c. Respiratory (Ventilation)
    d. Renal
    e. Drug Dose
5. Provides trend information in tabular format for 24 hours with selectable 1 minute to 3-hour resolution.
6. Data from local (bedside) monitor only. This is the same database (GDS) that the graphic trends feature uses.
7. Monitor must be configured by your local customer service representative.

-13 Three-Trace PC Monitor

1. Requires 3.50.xx (or above) software for entire network.
2. Monitor must be configured by your local customer service representative.

-14 Four-Trace PC Monitor

1. Requires 3.50.xx (or above) software for entire network.
2. Monitor must be configured by your local customer service representative.

-20 Data Shuttle

1. Requires 3.53.38EN, or above, (PC) or equivalent.
2. Monitors must be configured by your local customer service representative.
3. Only 90470 modules with 1.05.33EN (or above) software support Data Shuttle.

-26 Patient Data Logger

1. Provides an ASCII data stream in a predefined format to a dedicated serial (RS-232C) port.
2. (J8) RS-232C port is standard with the monitor, configured as DCE.
3. Patient data limited to bedside monitor with the PDL option.
4. Use the Bio-Med menu to assign the applicable serial port for the PDL option, then select the baud rate and desired sample rate.
5. Monitor must be configured by your local customer service representative.

-30 Alarm Relay

1. Part number 306684-003.
2. Provides an alarm relay to trigger customer-provided light or audible alarm.

-51 Bedside Chart

1. Provides a touchscreen window which allow users to interact with the PC Chartmaster (90825 or 90827) from a 90303(A)(B) monitor.
2. Requires a 90825 or 90827 (PC Chartmaster) on the same network.
3. Requires one of the following:
    a. The 10MHz (20MHz XTAL) CPU, 26MHz display controller, and fast ROM pack. The CPU board must also have the PC Mode memory bank and the bank-select PAL installed.
    b. The 436-0009-01 CPU drawer assembly.
4. Monitor must be configured by your local customer service representative.
5. Use the Bio-Med menu (application mode) to assign the fileserver's name to the bedside monitor.
6. Not compatible with Options -01, -02, -06, -07.
7. Bedside Chart software is located in the ROM pack, and DOES NOT require PC Mode to run.

90311 PCMS Central Monitor (PC)

Four-patient five-trace central monitor.

-12 Calcs and Tabular Trends

1. Data available from any PC bedside monitor on the network.
2. Requires 3.62.43EN (or above) software.
3. Requires 436-0009-01 CPU drawer assembly
4. Provides the following calculations:
    a. Hemodynamic
    b. Oxygenation
    c. Respiratory (Ventilation)
    d. Renal
    e. Drug Dose
5. Provides trend information in tabular format for 24-hours with selectable 1-minute to 3-hour resolution.
6. Data from remote bedside monitors. This is the same database (GDS) that the remote graphic trends feature uses.
7. Monitor must be configured by your local customer service representative.

90312 PCMS Central Monitor (PC)

Eight-patient ten-trace central monitor.

1. CPU Drawer is either 10MHz (20MHz CPU XTAL) P/N 436-0003-xx or 436-0009-xx. Display controller must be 26MHz. (P/N 308160-002). ROM pack must be either a 672-1000-xx or 672-0104-xx or equivalent foreign ROM pack.
2. Monitor must be configured by your local customer service representative.

-12 CALCS and Tabular Trends

1. Data available from any PC Bedside monitor on the network.
2. Requires 3.62.43EN (or above) software.
3. Requires 436-0009-01 CPU Drawer Assembly
4. Provides the following calculations:
    a. Hemodynamic
    b. Oxygenation
    c. Respiratory (Ventilation)
    d. Renal
    e. Drug Dose
5. Provides trend information in tabular format. 24-hour, selectable 1-minute to 3-hour resolution.
6. Data from remote bedside monitors. This is the same database (GDS) that the remote graphic trends feature uses.
7. Monitor must be configured by your local customer service representative.

Section 5: Parts List

NON-A MONITORS

CPU DRAWER ASMBLY - (NON-A 90303/90311 Monitors, 8 MHz (16 MHz XTAL) 306794-003
CPU DRAWER ASMBLY - (NON-A 90312/90303-08 Monitors, 10 MHz (20 MHz XTAL) . 306794-006
RESET PCBA - for all NON-A CPU Drawer Assemblies only 308225-001
ETHERNET STACK ASSEMBLY - for NON-A CPU Drawers 306315-001
IRTS RUPI CHIP (for all 306794-xxx CPU Drawers) 364050-002
SDLC RUPI CHIP (for all 306794-xxx CPU Drawers) 364100-029
RAM PIGGYBACK PCBA (Standard config, 512K) 306181-004
RAM PIGGYBACK PCBA (PC-Mode config 1-MEG) 670-0217-00
FUSE, 1 AMP - (for IRTS) 380101-010
DISPLAY CNTRLR - (EARLY, w/o Z-AXIS Piggyback attached, 25 MHz) 90303/90311 306210-003
DISPLAY CNTRLR - (EARLY, w/o Z-AXIS Piggyback attached, 26 MHz) 90312/90303-08 306210-004
Z-AXIS(PIGGYBACK) - FOR 306210-003/-004 ONLY 306445-001
X/Y DEFL. H.S. ASSEMBLY - EARLY (can only be used with Power Supply 306295-003) .. 306285-002
X/Y DEFL. H.S. ASSEMBLY - CURRENT
(for use with Power Supply 306299-002 & 119-0040-00 [12]) ..... 306289-001 or 119-0177-00
POWER SUPPLY ASSEMBLY - w/FAN (non-A MONITORS) 306295-003
A.C. POWER SWITCH PCBA (for use w/Power Supply 306295-003) 306580-001
PRE-REGULATOR PCBA 306235-002
DC/DC CONVERTER PCBA 306245-002
TOROID TRANSFORMER 306850-001
A.C. SWITCH PUSHBUTTON SHAFT (the Slide Bar) 306824-001
A.C. SWITCH PUSHBUTTON 362114-001
DIODE BRIDGE RECTIFIER 378000-173
POWER SUPPLY ASSEMBLY - w/o FAN (non-A MONITORS) 306299-002
PRE-REGULATOR PCBA 306235-002
DC/DC CONVERTER PCBA 306245-002
TOROID TRANSFORMER - non-A/B 306854-001
A.C. SWITCH PUSHBUTTON SHAFT (the Slide Bar) 306824-001
A.C. SWITCH PUSHBUTTON 362114-001
A.C. SWITCH BOARD - (for use with Power Supply 306299-002) 308230-001
DIODE BRIDGE RECTIFIER 378000-173
CRT (order also 306698-001, DUST SEAL) 362112-001
CRT SOCKET PCBA 306705-002
DEFLECTION YOKE ASSEMBLY 306609-001
TOUCHSCREEN ASSEMBLY (BLACK, for NON-A, A/B MONITORS) 306752-002
CRT FILTER - (order also 334-0162-00, "Hard-Key label) 306722-101
HVPS 366109-002
MODULE BACKPLANE PCBA - NON-A/ and A MONITORS 306250-004
FAN - NON-A Monitors 306618-003
FAN FILTER 306952-001
12-VOLT RECHARGEABLE BATTERY 384225-002
LITHIUM BATTERY 384322-001
SPEAKER 384379-001

A/B MONITORS

CPU DRAWER ASMBLY - ALL 90303/ 90311 A/B Monitors, 8MHz (16MHz XTAL) 436-0003-00
CPU DRAWER ASMBLY -
ALL 90312 AND 90303-08 A/B Monitors 10MHz (20MHz XTAL) 436-0003-04
IRTS RUPI CHIP (ALL 436-0003-XX CPU Drawers) 364050-002
SDLC RUPI CHIP (ALL 436-0003-XX CPU Drawers) 364100-029
ETHERNET CHIP ASSEMBLY (ALL 436-0003-XX CPU Drawers) 307566-001
FUSE, 1 AMP - (for IRTS) 380101-010
CPU DRAWER ASSEMBLY - (Surface-Mount Technology) 436-0009-00
DISPLAY CONTROLLER/Z-AXIS - (CURRENT, 25 MHz) 90303/ 90311 A/B 308160-001
DISPLAY CONTROLLER/Z-AXIS - (CURRENT, 26 MHZ) 90312 AND 90303-08 A/B 308160-002
X/Y DEFLECTION H.S. ASSEMBLY - CURRENT 306289-001
X/Y DEFLECTION PCBA 306585-001
POWER SUPPLY ASSEMBLY - A/B MONITORS 119-0040-00
AC MISC. PCBA - A/B MONITORS 306910-002
P.S. PCBA - A/B MONITORS 308105-001/101
TOROID TRANSFORMER - A/B MONITORS 308063-100
A.C. SWITCH BOARD - (FOR USE W/P.S. 119-0040-00 and [-12]) 308230-003
A.C. SWITCH BOARD - (REPLACES 308230-003) 670-0411-00
DIODE BRIDGE RECTIFIER 378000-173
(See CABLES section for the Power Supply's cables)
POWER SUPPLY ASSEMBLY - "B" MONITORS 119-0040-12
AC MISC. PCBA - A/B MONITORS 306910-002
P.S. PCBA - A/B MONITORS (Surface MountComponents, single adjustment pot) 670-0620-01
TOROID TRANSFORMER - A/B MONITORS 308063-100
A.C. SWITCH BOARD - (FOR USE W/P.S. 119-0040-00 and [-12]) 308230-003
A.C. SWITCH BOARD - (REPLACES 308230-003) 670-0411-00
DIODE BRIDGE RECTIFIER 378000-173
CRT (order also 306698-001, DUST SEAL) 362112-001
CRT SOCKET PCBA 306705-002
DEFLECTION YOKE ASSEMBLY 306609-001
TOUCHSCREEN ASSEMBLY (BLACK, for NON-A, A/B Monitors) 306752-002
CRT FILTER - (also order 334-0155-00 "Hard-Key" label) 306722-101
TOUCHSCREEN ASSEMBLY (GRAY, for A/B Monitors)) 306752-003
CRT FILTER - (also order 334-0162-00 "Hard-Key label 306722-101
HVPS 366109-002
MODULE BACKPLANE PCBA - non-A/ and A Monitors 306250-004
MODULE BACKPLANE PCBA - for all B Monitors (accepts Double-High Modules) 670-0349-01
FAN - A/B Monitors 306618-002
FAN FILTER 306952-001
12-VOLT RECHARGEABLE BATTERY 384225-002
LITHIUM BATTERY 384322-001
SPEAKER 384379-001

CHASSIS

NON-A MONITORS

TOP COVER - NON-A Monitors 306732-002
TOP COVER - INNER(Sheet metal) NON-A Monitors 306788-002
BOTTOM COVER - (w/o Slide Bar POWER SWITCH 306780-003
BOTTOM COVER - (w/ Slide Bar POWER SWITCH 306780-002
RIGHT SIDE COVER - (NON-A Monitors) 306998-002
LEFT SIDE COVER - (NON-A Monotors 306997-002
BEZEL - (NON-A Monitors 306730-002
DOOR, MODULE CAGE 306769-002
HINGE PIN 306766-001
SPRING 306767-001
LABEL, CRT FILTER - (Touchscreen "Hard Keys") 334-0155-00
LABEL, POWER SWITCH - (Mains On/OFF) 306995-001

A/B MONITORS (Original Colors)

TOP COVER - A/B Monitors 200-0042-00
BOTTOM COVER - A/B Monitors 432-0006-00
BEZEL - A/B Monitors 203-0011-00
DOOR, MODULE CAGE 306769-002
HINGE PIN 306766-001
SPRING 306767-001
DIVIDER, MODULE CAGE - (90306 & all B-Monitors only) 426-0019-00
LABEL, CRT FILTER - (Touchscreen "Hard Keys") 334-0155-00
LABEL, POWER SWITCH - (Mains On/OFF) 306995-001

A/B MONITORS (New Colors)

TOP COVER - A/B Monitors 200-0127-00
BOTTOM COVER (BASE) - A/B Monitors 432-0013-02
BEZEL - A/B Monitors 203-0032-02
DOOR, MODULE CAGE 202-0014-01
HINGE PIN 306766-001
SPRING 306767-001
DIVIDER, MODULE CAGE - (B-Monitors only) 426-0034-01
LABEL, CRT FILTER - (Touchscreen "Hard Keys") 334-0162-00

COMMON TO ALL MONITORS

KEYBOARD HOLE PLUG 360417-001
CRT FILTER (must also order Touchscreen Label 334-0155-00 or 334-0162-00) 306722-101
DUST SEAL 306698-001
ROMPACK S/W LABEL 334-0444-00
ROMPACK PLASTIC GUIDE 386-0063-00
DISPLAY CONTROLLER BRACKET 407-0077-00
FOOT - SELF-ADHESIVE 306946-001
FAN FILTER 306952-001
12-VOLT RECHARGEABLE BATTERY 384225-002
LITHIUM BATTERY 384322-001
SPEAKER 384379-001

CABLES

INTERNAL SDLC (CPU to Module Backplane) 306604-001
HVPS TO Z-AXIS 306607-001
DISPLAY CONTROLLER TO DEFLECTION 306608-101
CPU TO SPEAKER 306622-001
CPU TO TOUCHSCREEN 306631-101
TOUCHSCREEN TO DISPLAY CONTROLLER - (for Ambient Light Sensor) 306632-001
BEZEL TO CHASSIS GROUND (Grounding clip) 175-0373-00
MODULE BACKPLANE TO FAN 306633-001
MODULE BACKPLANE TO HIGH-LEVEL (B-Monitors only) 175-0467-00
PS BOARD TO DEFLECTION H.S. - (for 119-0040-00 PS) 175-0367-00
PS BOARD TO DEFLECTION H.S. -
(for 119-0040-12 PS, has ferrite clamps for EMI suppression) 175-0367-01
PS BOARD TO MODULE BACKPLANE - (for 119-0040-00and 119-0040-12 PS) 175-0366-00
PS BOARD TO CPU - (for 119-0040-00 PS) 175-0345-00
PS BOARD TO CPU - (for 119-0040-12 PS, has ferrite clamps for EMI suppression) 175-0345-01
PS TO AC MISC (Battery Enable, for 119-0040-00 [-12] PS) 175-0375-00
PS TO AC MISC (+24vdc, for 119-0040-00 [-12] PS) 175-0371-01
AC POWER CORD - (Domestic, straight) 306623-001
AC POWER CORD - (Domestic, 90o) 161-0138-00
AC POWER CORD BRACKET - (for 161-0138-00 Power Cord) 407-0057-00
PS ADAPTOR - (306299-002 PS to "A/B" POWER SWITCH 308230-003) 175-0456-00
PS ADAPTOR - (119-0040-00 [-12] to POWER SWITCH 308230-001) 175-0455-00

ACCESSORIES

PC TO VIDCO 460/6 INTERFACE CABLE 306659-001
PC TO VIDCO SMDS 320 INTERFACE CABLE 306652-001
PC TO 4 CHANNEL RECORDER INTERFACE CABLE 303570-003
PC INTERFACE CABLE (3'-6'-12') 366139-003/006/012
PCBA JUMPERS 384382-001
EXTENDER CABLE KIT 040-0043-00
CPU to MODULE BACKPLANE Extender Cable 306604-100
HVPS to Z-AXIS Extender Cable 306607-100
CRT SOCKET PCBA Extender Cable 306705-100
PS to CPU Extender Cable 175-0329-00
AMBIENT LIGHT SENSOR & SPEAKER Extender Cable(s) 175-0331-00
DISPLAY CONTROLLER to DEFLECTION HS Extender Cable 175-0332-00
CPU to TOUCHSCREEN Extender Cable 175-0332-00
DEFLECTION HS to YOKE Extender Cable 175-0430-00
SINGLE-HIGH MODULE EXTENDER CABLE 175-0360-00
DOUBLE-HIGH MODULE EXTENDER CABLE 012-0119-00

PC MODE OPTION - (90303, 90311, 90312 PC)

3.5" DISK DRIVE MODULE 90410
PC-MODE KEYBOARD 90411
DISK CONTROLLER BOARD - (iSBX J12) 670-0216-00
CABLE - DISK CONTROLLER to MODULE BACKPLANE 306692-101
DRAM PIGGYBACK PCBA - (1 MB, NON-A CPU) 670-0217-00
PARALLEL I/O BOARD - (iSBX J10 or J11) 306495-001
PANEL PLATE - (PARALLEL I/O BOARD) 306398-001
DUAL SERIAL BOARD - (iSBX J10 or J11) 306675-001
PANEL PLATE - (DUAL SERIAL I/O)
RAM BANK CONTROL PAL CHIP - (A/B CPU Boards, U145) 160-0680-00
PIVOT DISKETTE 063-0116-00
BLANK DISKETTE (PRE-FORMATTED-720K) 063-0044-00

NON-A MONITORS

CPU DRAWER ASSEMBLY - (NON-A 90303/90311 Monitors, 8 MHz (16 MHz XTAL) 306794-003
CPU DRAWER ASSEMBLY -
(NON-A 90312/90303-08 Monitors, 10 MHz (20 MHz XTAL) 306794-006
RESET PCBA - for all NON-A CPU Drawer Assemblies only 308225-001
ETHERNET STACK ASSEMBLY - for NON-A CPU Drawers 306315-001
IRTS RUPI CHIP (for all 306794-xxx CPU Drawers) 364050-002
SDLC RUPI CHIP (for all 306794-xxx CPU Drawers) 364100-029
RAM PIGGYBACK PCBA (Standard config, 512K) 306181-004
RAM PIGGYBACK PCBA (PC-Mode config 1-MEG) 670-0217-00
FUSE, 1 AMP - (for IRTS) 380101-010
DISPLAY CNTRLER - (EARLY, w/o Z-AXIS Piggyback attached, 25 MHz) 90303/90311 .. 306210-003
DISPLAY CNTRLER -
(EARLY, w/o Z-AXIS Piggyback attached, 26 MHz) 90312/90303-08 306210-004
Z-AXIS (PIGGYBACK) - FOR 306210-003/-004 ONLY 306445-001
X/Y DEFL. H.S. ASSEMBLY - EARLY (can only be used with Power Supply 306295-003) .. 306285-002
X/Y DEFL. H.S. ASSEMBLY - CURRENT
(for use with Power Supply 306299-002 & 119-0040-00 [12]) ..... 306289-001 or 119-0177-00
POWER SUPPLY ASSEMBLY - w/FAN (non-A MONITORS) 306295-003
A.C. POWER SWITCH PCBA (for use w/Power Supply 306295-003) 306580-001
PRE-REGULATOR PCBA 306235-002
DC/DC CONVERTER PCBA 306245-002
TOROID TRANSFORMER 306850-001
A.C. SWITCH PUSHBUTTON SHAFT (the Slide Bar) 306824-001
A.C. SWITCH PUSHBUTTON 362114-001
DIODE BRIDGE RECTIFIER 378000-173
POWER SUPPLY ASSEMBLY - w/o FAN (non-A MONITORS) 306299-002
PRE-REGULATOR PCBA 306235-002
DC/DC CONVERTER PCBA 306245-002
TOROID TRANSFORMER - non-A/B 306854-001
A.C. SWITCH PUSHBUTTON SHAFT (the Slide Bar) 306824-001
A.C. SWITCH PUSHBUTTON 362114-001
A.C. SWITCH BOARD - (for use with Power Supply 306299-002) 308230-001
DIODE BRIDGE RECTIFIER 378000-173
CRT (order also 306698-001, DUST SEAL) 362112-001

CRT SOCKET PCBA 306705-002
DEFLECTION YOKE ASSEMBLY 306609-001
TOUCHSCREEN ASSEMBLY (BLACK, for NON-A, A/B MONITORS) 306752-002
CRT FILTER - (order also 334-0162-00, "Hard-Key label) 306722-101
HVPS 366109-002
MODULE BACKPLANE PCBA - NON-A/ and A MONITORS 306250-004
FAN - NON-A Monitors 306618-003
FAN FILTER 306952-001
12-VOLT RECHARGEABLE BATTERY 384225-002
LITHIUM BATTERY 384322-001
SPEAKER 384379-001

PC MONITORS - 90303/ 90311/ 90312 (A/B)

ELECTRONIC ASSEMBLIES

X/Y DEFLECTION H.S. ASSEMBLY - CURRENT 306289-001
X/Y DEFLECTION PCBA 306585-001
POWER SUPPLY ASSEMBLY - A/B MONITORS 119-0040-00
AC MISC. PCBA - A/B MONITORS 306910-002
P.S. PCBA - A/B MONITORS 308105-001/101
TOROID TRANSFORMER - A/B MONITORS 308063-100
A.C. SWITCH BOARD - (FOR USE W/P.S. 119-0040-00 and [-12]) 308230-003
A.C. SWITCH BOARD - (REPLACES 308230-003) 670-0411-00
DIODE BRIDGE RECTIFIER 378000-173
(See CABLES section for the Power Supply's cables)
POWER SUPPLY ASSEMBLY - "B" MONITORS 119-0040-12
AC MISC. PCBA - A/B MONITORS 306910-002
P.S. PCBA - A/B MONITORS (Surface Mount Components, single adjustment pot) . 670-0620-01
TOROID TRANSFORMER - A/B MONITORS 308063-100
A.C. SWITCH BOARD - (FOR USE W/P.S. 119-0040-00 and [-12]) 308230-003
A.C. SWITCH BOARD - (REPLACES 308230-003) 670-0411-00
DIODE BRIDGE RECTIFIER 378000-173
(See CABLES section for the Power Supply's cables)
CRT (order also 306698-001, DUST SEAL) 362112-001
CRT SOCKET PCBA 306705-002
DEFLECTION YOKE ASSEMBLY 306609-001
TOUCHSCREEN ASSEMBLY (BLACK, for NON-A, A/B Monitors) 306752-002
CRT FILTER - (also order 334-0155-00 "Hard-Key" label) 306722-101
TOUCHSCREEN ASSEMBLY (GRAY, for A/B Monitors)) 306752-003
CRT FILTER - (also order 334-0162-00 "Hard-Key label 306722-101
HVPS 366109-002
MODULE BACKPLANE PCBA - non-A/ and A Monitors 306250-004
MODULE BACKPLANE PCBA - for all B Monitors (accepts Double-High Modules) 670-0349-01
FAN - A/B Monitors 306618-002
FAN FILTER 306952-001
12-VOLT RECHARGEABLE BATTERY 384225-002
LITHIUM BATTERY 384322-001
SPEAKER 384379-001

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NON-A MONITORS

TOP COVER - NON-A Monitors 306732-002
TOP COVER - INNER(Sheet metal) NON-A Monitors 306788-002
BOTTOM COVER - (w/o Slide Bar POWER SWITCH 306780-003
BOTTOM COVER - (w/ Slide Bar POWER SWITCH 306780-002
RIGHT SIDE COVER - (NON-A Monitors) 306998-002
LEFT SIDE COVER - (NON-A Monotors 306997-002
BEZEL - (NON-A Monitors 306730-002
DOOR, MODULE CAGE 306769-002
HINGE PIN 306766-001
SPRING 306767-001
LABEL, CRT FILTER - (Touchscreen "Hard Keys") 334-0155-00
LABEL, POWER SWITCH - (Mains On/OFF) 306995-001

A/B MONITORS (Original Colors)

TOP COVER - A/B Monitors 200-0042-00
BOTTOM COVER - A/B Monitors 432-0006-00
BEZEL - A/B Monitors 203-0011-00
DOOR, MODULE CAGE 306769-002
HINGE PIN 306766-001
SPRING 306767-001
DIVIDER, MODULE CAGE - (90306 & all B-Monitors only) 426-0019-00
LABEL, CRT FILTER - (Touchscreen "Hard Keys") 334-0155-00
LABEL, POWER SWITCH - (Mains On/OFF) 306995-001

A/B MONITORS (New Colors)

TOP COVER - A/B Monitors 200-0127-00
BOTTOM COVER (BASE) - A/B Monitors 432-0013-02
BEZEL - A/B Monitors 203-0032-02
DOOR, MODULE CAGE 202-0014-01
HINGE PIN 306766-001
SPRING 306767-001
DIVIDER, MODULE CAGE - (B-Monitors only) 426-0034-01
LABEL, CRT FILTER - (Touchscreen "Hard Keys") 334-0162-00

COMMON TO ALL MONITORS

KEYBOARD HOLE PLUG 360417-001
CRT FILTER (must also order Touchscreen Label 334-0155-00 or 334-0162-00) 306722-101
DUST SEAL 306698-001
ROMPACK S/W LABEL 334-0444-00
ROMPACK PLASTIC GUIDE 386-0063-00
DISPLAY CONTROLLER BRACKET 407-0077-00
FOOT - SELF-ADHESIVE 306946-001
FAN FILTER 306952-001
12-VOLT RECHARGEABLE BATTERY 384225-002
LITHIUM BATTERY 384322-001
SPEAKER 384379-001

CABLES

INTERNAL SDLC (CPU to Module Backplane) 306604-001
HVPS TO Z-AXIS 306607-001
DISPLAY CONTROLLER TO DEFLECTION 306608-101
CPU TO SPEAKER 306622-001
CPU TO TOUCHSCREEN 306631-101
TOUCHSCREEN TO DISPLAY CONTROLLER - (for Ambient Light Sensor) 306632-001
BEZEL TO CHASSIS GROUND (Grounding clip) 175-0373-00
MODULE BACKPLANE TO FAN 306633-001
MODULE BACKPLANE TO HIGH-LEVEL (B-Monitors only) 175-0467-00
PS BOARD TO DEFLECTION H.S. - (for 119-0040-00 PS) 175-0367-00
PS BOARD TO DEFLECTION H.S. -
(for 119-0040-12 PS, has ferrite clamps for EMI suppression) 175-0367-01
PS BOARD TO MODULE BACKPLANE - (for 119-0040-00and 119-0040-12 PS) 175-0366-00
PS BOARD TO CPU - (for 119-0040-00 PS) 175-0345-00
PS BOARD TO CPU - (for 119-0040-12 PS, has ferrite clamps for EMI suppression) 175-0345-01
PS TO AC MISC (Battery Enable, for 119-0040-00 [-12] PS) 175-0375-00
PS TO AC MISC (+24vdc, for 119-0040-00 [-12] PS) 175-0371-01
AC POWER CORD - (Domestic, straight) 306623-001
AC POWER CORD - (Domestic, 90o) 161-0138-00
AC POWER CORD BRACKET - (for 161-0138-00 Power Cord) 407-0057-00
PS ADAPTOR - (306299-002 PS to "A/B" POWER SWITCH 308230-003) 175-0456-00
PS ADAPTOR - (119-0040-00 [-12] to POWER SWITCH 308230-001) 175-0455-00

ACCESSORIES

PC TO VIDCO 460/6 INTERFACE CABLE 306659-001
PC TO VIDCO SMDS 320 INTERFACE CABLE 306652-001
PC TO 4 CHANNEL RECORDER INTERFACE CABLE 303570-003
PC INTERFACE CABLE (3'-6'-12') 366139-003/006/012
PCBA JUMPERS 384382-001
EXTENDER CABLE KIT 040-0043-00
CPU to MODULE BACKPLANE Extender Cable 306604-100
HVPS to Z-AXIS Extender Cable 306607-100
CRT SOCKET PCBA Extender Cable 306705-100
PS to CPU Extender Cable 175-0329-00
AMBIENT LIGHT SENSOR & SPEAKER Extender Cable(s) 175-0331-00
DISPLAY CONTROLLER to DEFLECTION HS Extender Cable 175-0332-00
CPU to TOUCHSCREEN Extender Cable 175-0332-00
DEFLECTION HS to YOKE Extender Cable 175-0430-00
SINGLE-HIGH MODULE EXTENDER CABLE 175-0360-00
DOUBLE-HIGH MODULE EXTENDER CABLE 012-0119-00

INTERNATIONAL

Assy, Base, PC1, International (650-0196-02)

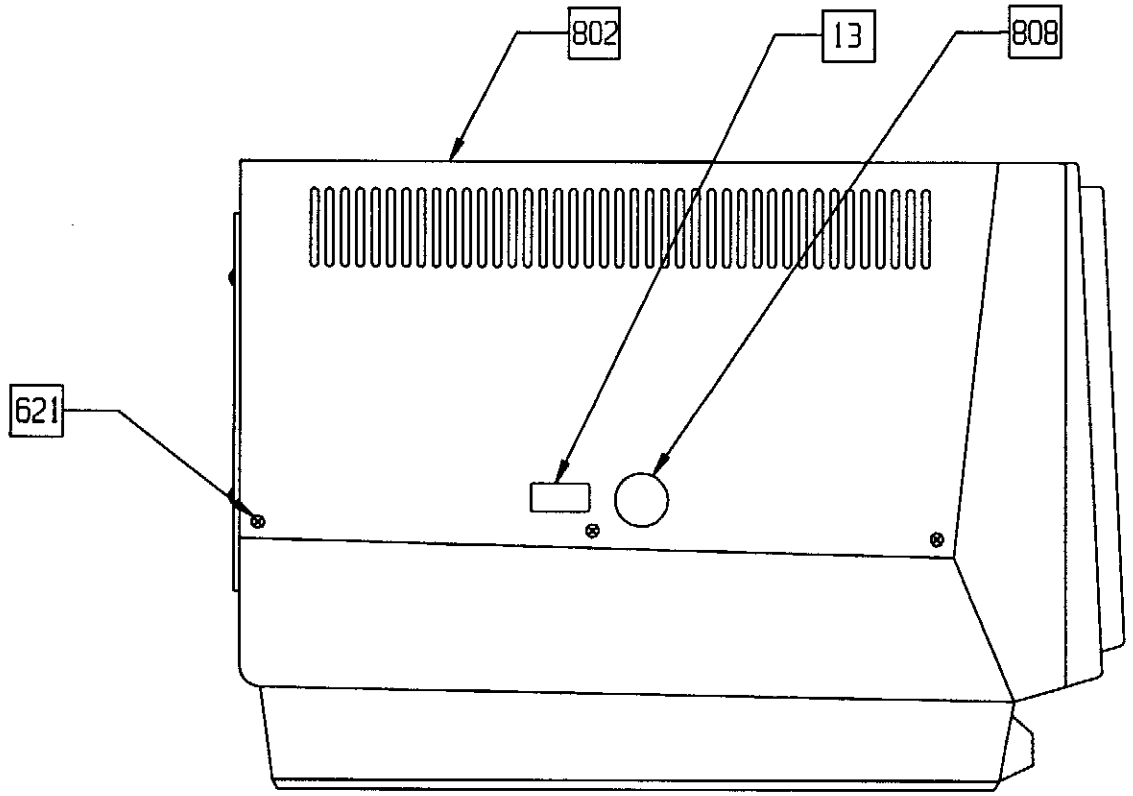
LABEL, M/F IDENT, EN/FR/GR (1) 334-0681-00
6-32 X 3/8P.PNHD.ST.C (2) 358303-002
6-32 X 3/8PH.FL.HD.ST. (4) 358303-007
NUT, 6-32, KEPS, STL, .312H (2) 210-0457-00
WASHER-#6, FL.FIBRE (1) 358067-005
CABLE ASSY, LDR TO DISPLY CONTROLLER (1) 306632-002
BRACKET BATTERY (1) 306802-001
LABEL, BATTERY, PCMS, 12V, 2.5AHR (1) 334-0429-00
WASHER, 1/4 LOCK (1) 358068-003
MYLAR TAPE (0.30000) 384132-002
YOKE, DEFL, ALPHA PC (1) 384367-001
BRACKET, CHASSIS TO COVER CONN, R (1) 407-0171-00
BRACKET, CHASSIS TO COVER CONN, L (1) 407-0172-00
BOTTOM FAN, REMOTE HSG (1) 306618-002
GUARD, FAN 3.0X3.0, WIRE TYPE (1) 200-0046-00
BRACKET, CPU DRAWER RIGHT (1) 407-0049-00
BRACKET, CPU DRAWER LEFT (1) 407-0050-00
PLATE, FAN FILTER COVER (1) 386-0050-01
6-32X5/16 SCREW (9) 358302-002
WSHR, LOCK, # 6, INT, OD.283, .018THK (14) 210-0006-00
PCB ASSY, AC SWITCH, NE18, PCMS (1) 670-0411-01
SCREW, PN.HD.CRS.STL (4) 358263-002
WASHER, #4 FLAT (5) 358074-001
SCREW, MAC, 4-40, PAN, PHPS, STL, .250 (12) 211-0008-00
WASHER, LOCK #4 (8) 358074-002
CLIP GROUND CPU DRAWER (6) 214-0136-00
SPACER, NYLON, 1/2 (2) 360004-008
SCR, #4X1.25, FLT, PHIL, STEEL, ZINC, 100 (2) 213-5121-00
INSULATOR, BOTTOM, AC SWITCH (1) 342-0066-00
INSULATING BARRIER, TOP, AC SWITCH (1) 342-0065-00
SCR, 2-56, PAN, L.750, STL, PHIL, ZINC PL (2) 211-0102-00
6X3/8PH.FL.HD.SHT.MT (6) 358702-045
SCREEN, FAN (1) 378-0008-00
LABEL, INFO, AIR FILTER REPLACEMENT (1) 334-0432-00
MISC, TAPE, DBL COATED, CREPE 1IN WIDE (0.166000) 384403-001
WASHER, LOCK SPLIT#2 (2) 358053-005
WASHER, FLAT#2 (2) 358072-001
SPACER, NYLON, #4, L.5, .187OD (4) 361-5049-00
4-40X1PH.PN.HD.ST.CA (1) 358261-002
SPACER, RND, .5"OD, .14"ID, .75"L, NYLON (1) 361-0102-00
BRACKET, CRT (1) 407-0051-00
CARD GUIDE DEEP CHL (2) 384273-001
PH.PN.HD.ST.ZINC. (2) 358451-002
10-32X1/2P.PN.HD.ST. (5) 358455-002
SCREW, MAC, 4-40, BUTT, SOCK, , .188 (8) 211-0044-00
WASHER, RECT, .250X.500X.030 .127 ID (8) 210-0014-00
WASHER, FLAT (4) 358078-001
WASHER (10) 358078-003

6-32X1/4SCREW PN.HD. (8) 358301-002
NUTLOCK (5) 358087-003
WASHER (4) 358059-003
WHSR, LOCK, # 4, INT, OD.26, .015THK (14) 210-0004-00
SPRING, EXTENSION, 12.0L (1) 360424-001
LABEL, CAUTION HI VOLTAGE(CRT) (1) 308242-001
LUG (2) 358124-001
CABLE ASSY, FACIA GROUND (1) 175-0373-00
CABLE ASSY, CRT GROUND (1) 175-0374-00
BRACKET, PWR SPLY RIGHT REAR (1) 407-0047-00
BRACKET, DEFLECTION, LEFT REAR (1) 407-0135-00
FRAME, MODULE CAGE, 90303B (1) 426-0020-01
DIVIDER, MODULE CAGE (2) 426-0034-01
PCB ASSY, BACKPLANE, PCMS (1) 670-0349-01
SCREW, FL.HD.ST.ZINC. (4) 358251-007
LABEL, FUSE RATING, MODULE CAGE (1) 308241-001
FACIA ASSY, PC1, INTERNATIONAL (1) 306752-003
ASSY, DEFLECTION, PC1 (1) 119-0177-01
WASHER, #6 SPLT LK (1) 358076-002
WASHER, FLAT-6 (1) 358076-006
6-32X3/8PH.PN.HD.BLK (7) 358303-015
POWER SUPPLY ASSY (INTERNATIONAL) (1) 119-0040-03
COVER, TOP, 90303B (1) 200-0127-04
LABEL, EXPLOSION HAZARD, MUN N7.75 (1) 334-0481-00
HOLE PLUG (1) 360417-001
PCBA, DISPLAY CONTROLLER (1) 308160-002
SUPPORT, ROM PACK ALPHA PCMS (1) 386-0063-01
PCB ASSY, CPU (1) 670-0477-03
DRAWER, CPU, 90303B (1) 436-0004-01
LABEL, MAINS, SWITCH (1) 334-0483-01
COVER PLATE (2) 306958-001
COVER, CONNECTOR, 15 PIN DB (1) 200-0069-00
COVER, RS232 INTERNATIONAL (1) 200-0146-01
COVER, EXTERNAL ALARM INTERNATIONAL (1) 200-0145-01
LABEL, EQUIPOTENTIALITY, IEC417-5021 (1) 334-0436-00
LABEL;IDENT. FUNCTIONAL GROUND (1) 334-0328-00
GASKET, EMI, BECU, CONTACT STRIP (1) 348-0159-00
BERYLLIUM, COPPER FINGERS-CLIP ON (0.400000 APPROX 6" PER UNIT) 214-0266-00
TAPE, ALUMINUM, CONDUCTIVE ADHESIVE (0.034900) 253-0031-00
BERYLLIUM, COPPER FINGERS-SELF-ADH 214-0267-00
..... (0.667000 APPROX 10" PER UNIT)
SCR, W/WASHER, 4-40X.375, PAN, PHIL (5) 211-0072-00
GASKET, CLIP-ON, BECU, COMPRESS (1) 348-0166-00
PCB ASSY, CANCELLATION COIL (1) 670-0473-00
LABEL, CPU DRAWER, PC1 (1) 334-0670-00

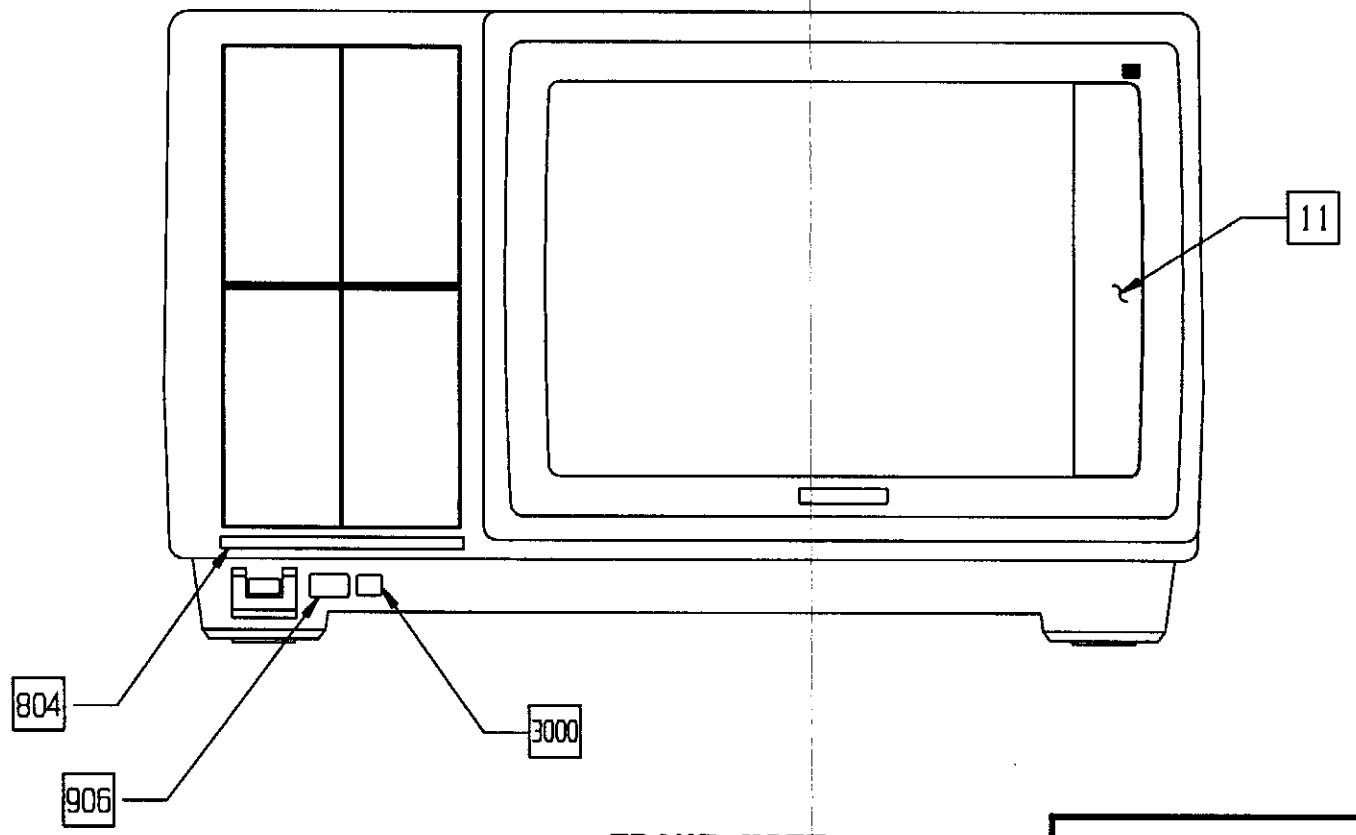
Planning Module, 90303B/90311/90312, Domestic

Planning Module, 90303B/90311/90312, Domestic 655-0580-00
PWR CORD, DOM, 120V, 10A, 18AWG, 10' (1) 161-0032-00
MODULE, FLASH ROMPACK, PC1, ENGLISH (1) 672-1000-00
SCREW, 8-32X.375, FORMING, BLK OX, PNPH (2) 212-0015-00
BRACKET, POWER CORD RETAINER, PC1 (1) 407-0222-00
BRACKET, POWER CORD RETAINER, PC1 (1) 407-0222-01
LABEL, I.D. ETL, CHATSWORTH (1) 334-0606-00
SHIELD (1) 337-0071-01
SCREW PN.HD 4-40X3/8 (3) 358253-084
LABEL, HARDKEY, ENGLISH, PC-1 (1) 334-0803-00
LABEL, KEYBOARD CONNECTOR, ENGLISH (1) 334-0482-01
LABEL, ISOLATED INPUTS, USA ONLY (1) 334-0484-01
LABEL, MAIN WARNING (1) 334-0172-01
127 90303B07081020C EN

Item	Part Number	Description
11	334-0803-00	LABEL,HARDKEY,ENGLISH,PC-1
13	334-0332-01	LABEL,KEYBOARD
804	334-0484-01	LABEL,ISOLATED INPUTS,USA ONLY
802	200-0127-04	COVER,TOP,90303B
808	360417-001	HOLE PLUG
906	334-0483-01	LABEL,MAINS,SWITCH



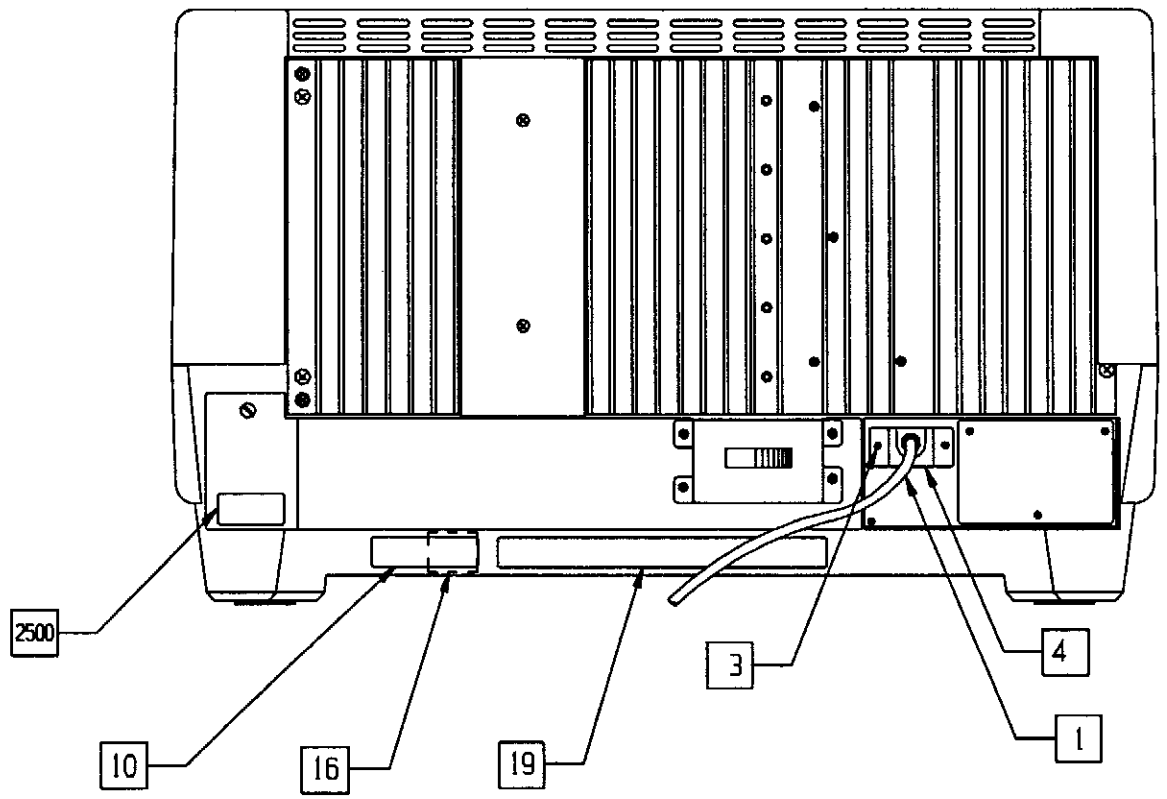
LEFT SIDE VIEW



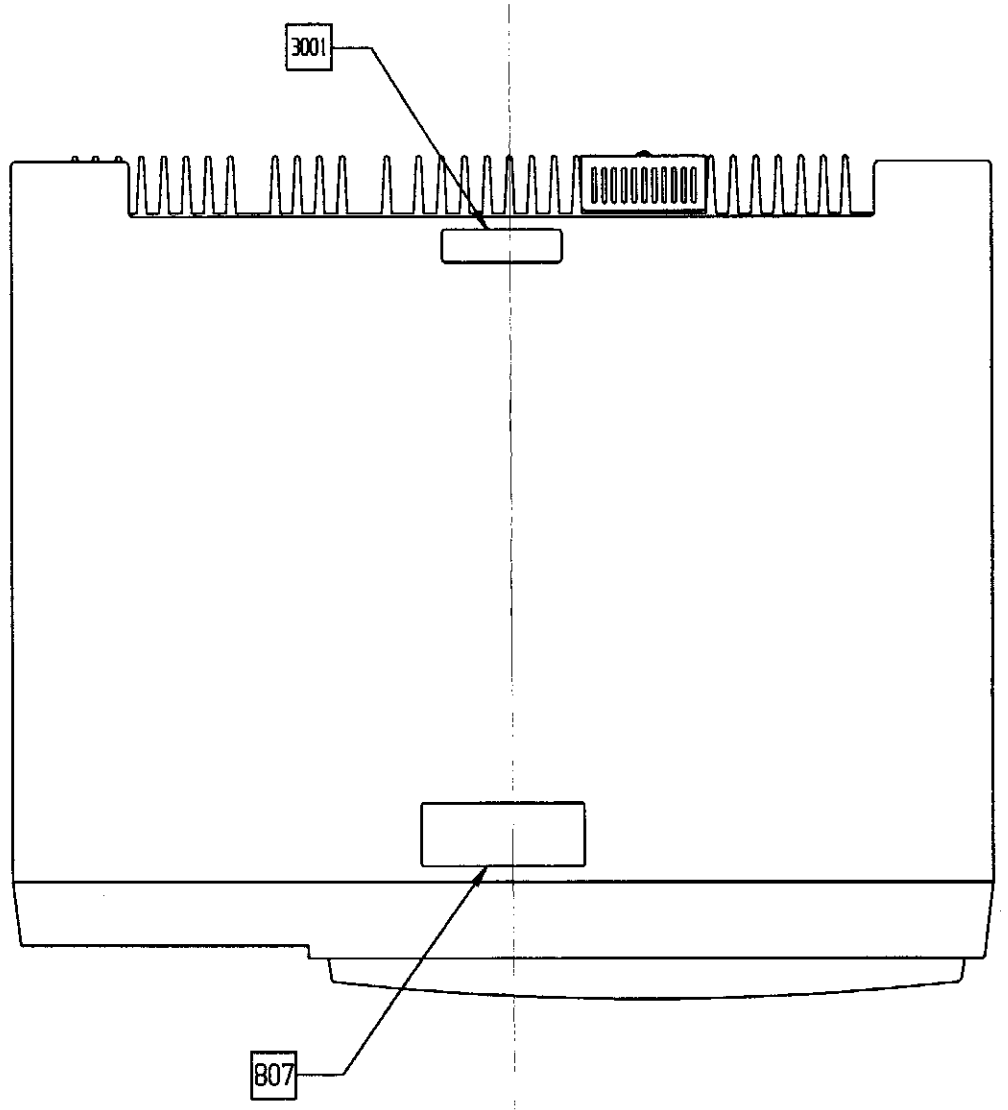
FRONT VIEW

Top Assembly
P/N 650-0196-XX
Sheet 1 of 9

Item	Part Number	Description
1	161-0032-00	PWR CORD,DOM,120V,10A,18AWG,10'
~~3~~	~~212-0015-00~~	~~SCREW,8-32X.375,FORMING,BLK OX,PNPH~~
4	407-0222-01	BRACKET,POWER CORD RETAINER,PC1
19	334-0681-00	LABEL,M/F IDENT,-EN/FR/GR
2500	334-0670-00	LABEL,CPU DRAWER,PC1



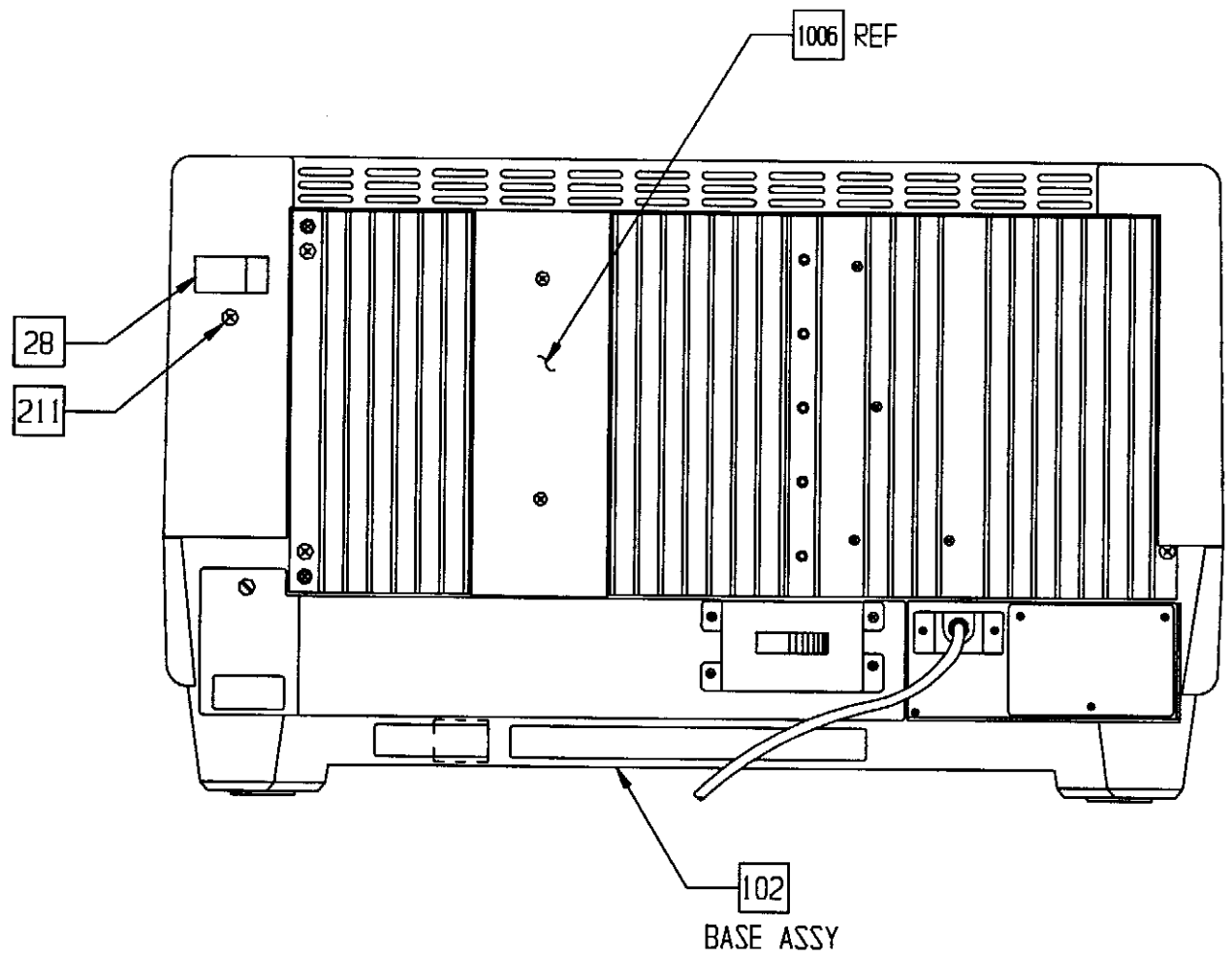
SECTION A-A
REAR VIEW

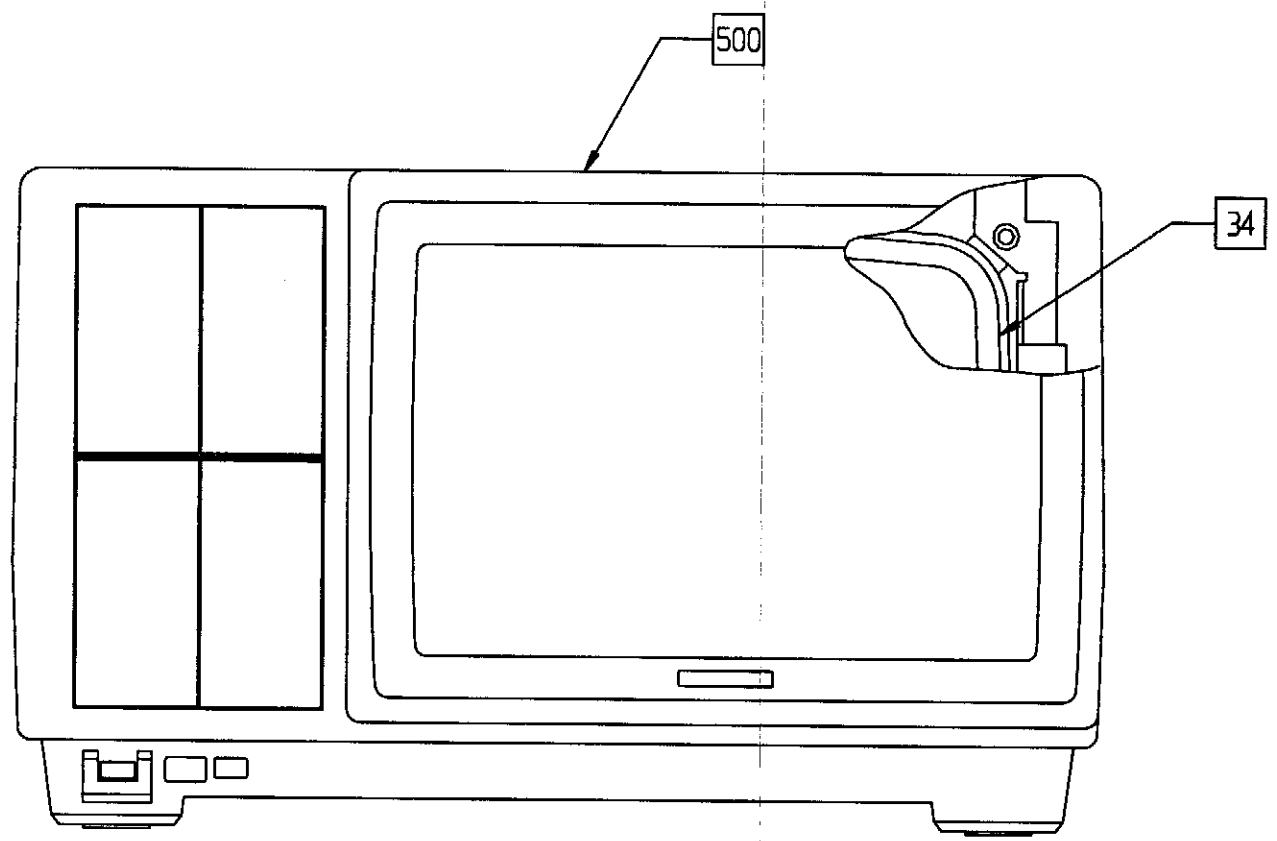


TOP VIEW

Top Assembly
P/N 650-0196-XX
Sheet 2 of 9

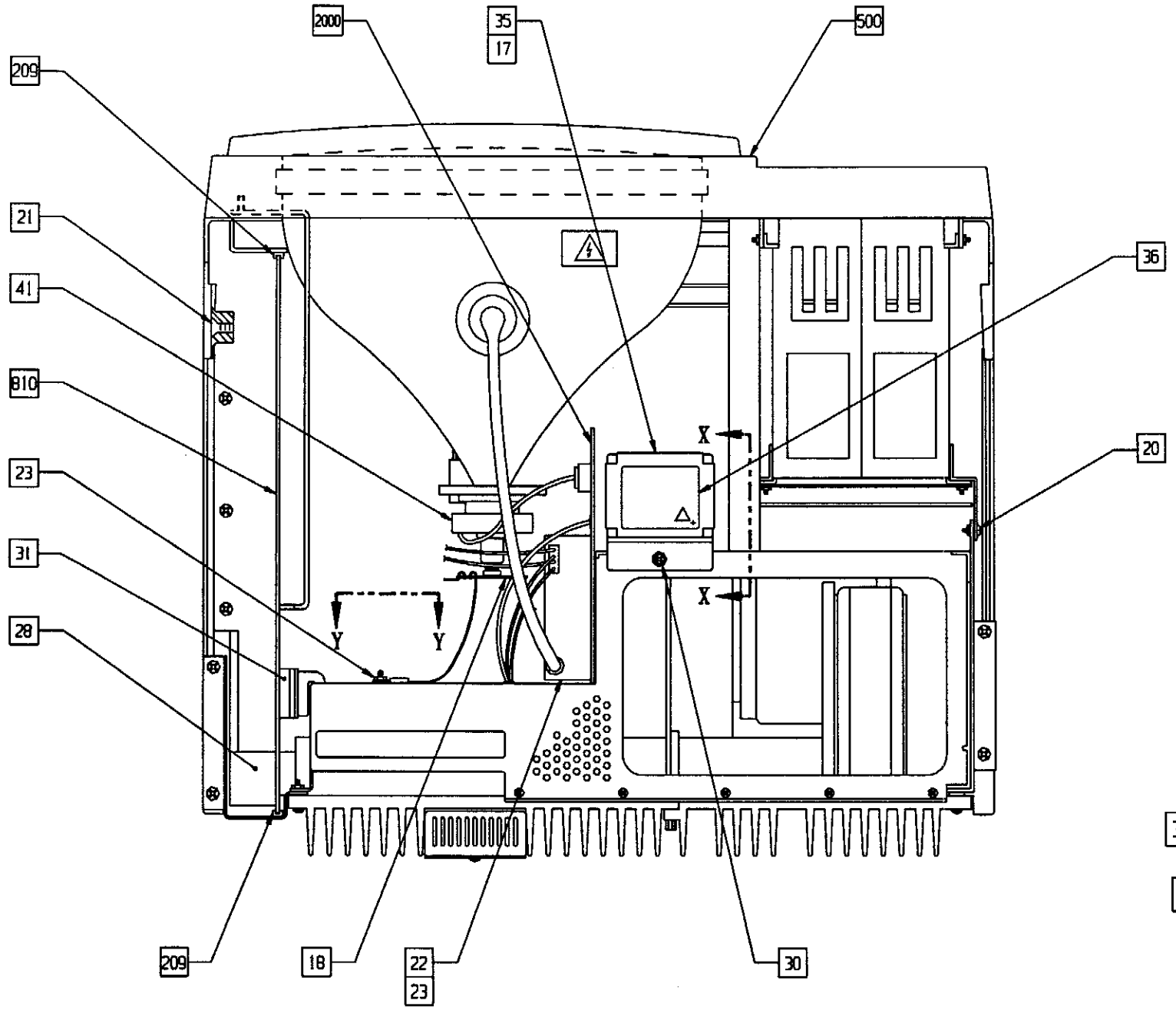
Item	Part Number	Description
28	407-0077-00	BRACKET,DISPLAY CONTROL
~~34~~	~~306898-001~~	~~DUST EXCLUSION SEAL CRT~~
102	432-0013-02	BASE
211	358455-002	10-32X1/2P.PN.HD.ST.
500	306752-003	FACIA ASSY,PC1,INTERNATIONAL

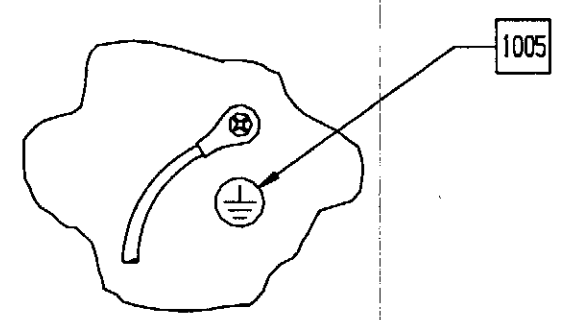




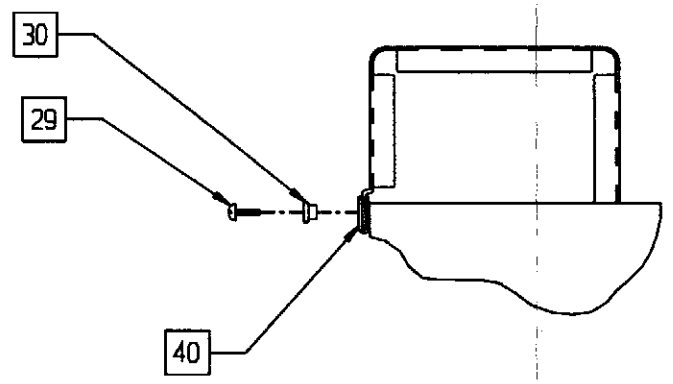
Top Assembly
P/N 650-0192-XX
Sheet 3 of 9

Item	Part Number	Description
17	384225-002	BATTERY 12V RECHRGB
18	306705-002	PCBA,CRT SOCKET
20	358303-002	6-32X3/8P.PNHD.ST.C
21	358303-007	6-32X3/8PH.FL.HD.ST.
22	366109-002	HIGH VOLTAGE POWER SUPPLY
23	210-0457-00	NUT, 6-32,KEPS ,STL,.312H
28	407-0077-00	BRACKET,DISPLAY CONTROL
30	358067-005	WASHER-#6,FL.FIBRE
31	306608-101	CBL ASSY,DSPLY CNTRL TO DEFLECT
35	306802-001	BRACKET BATTERY
36	334-0429-00	LABEL,BATTERY,PCMS,12V,2.5AHR
40	384132-002	MYLAR TAPE
41	384367-001	YOKE,DEFL,ALPHA PC
209	384273-001	CARD GUIDE DEEP CHL
0810	308160-002	PCBA,DISPLAY CONTROLLER



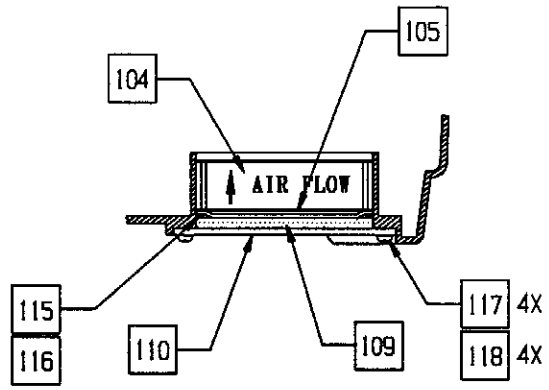


VIEW Y-Y

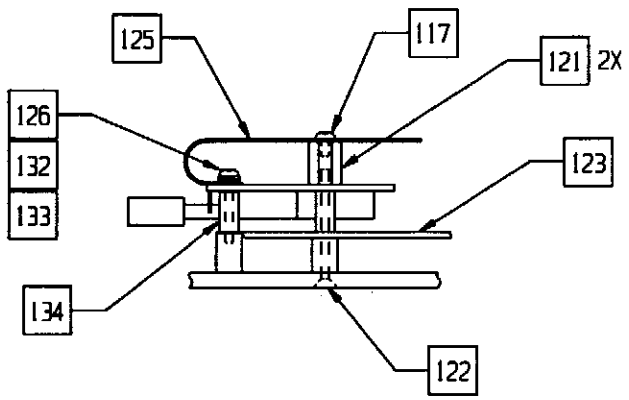


VIEW X-X

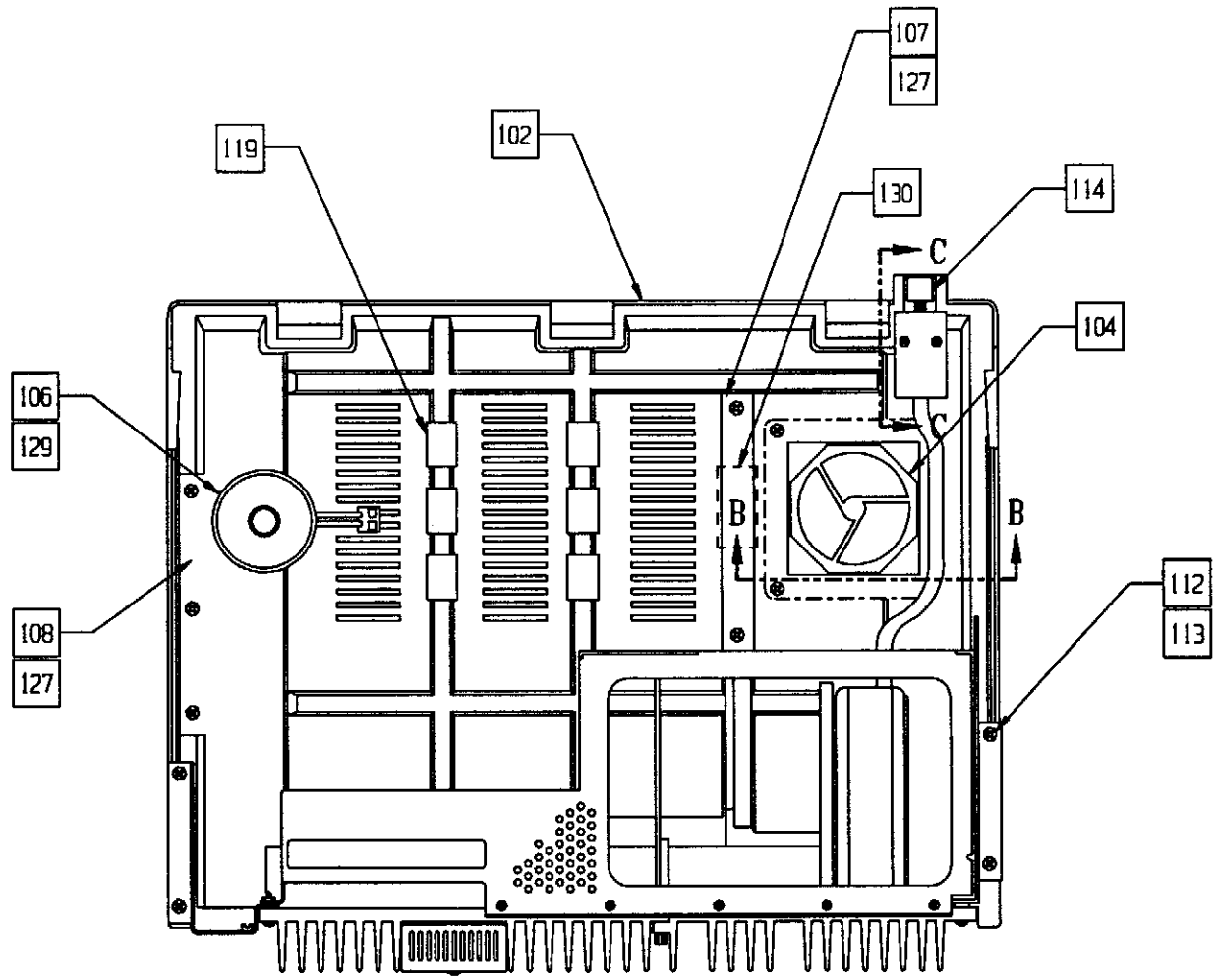
Top Assembly
P/N 650-0196-XX
Sheet 4 of 9



SECTION B-B



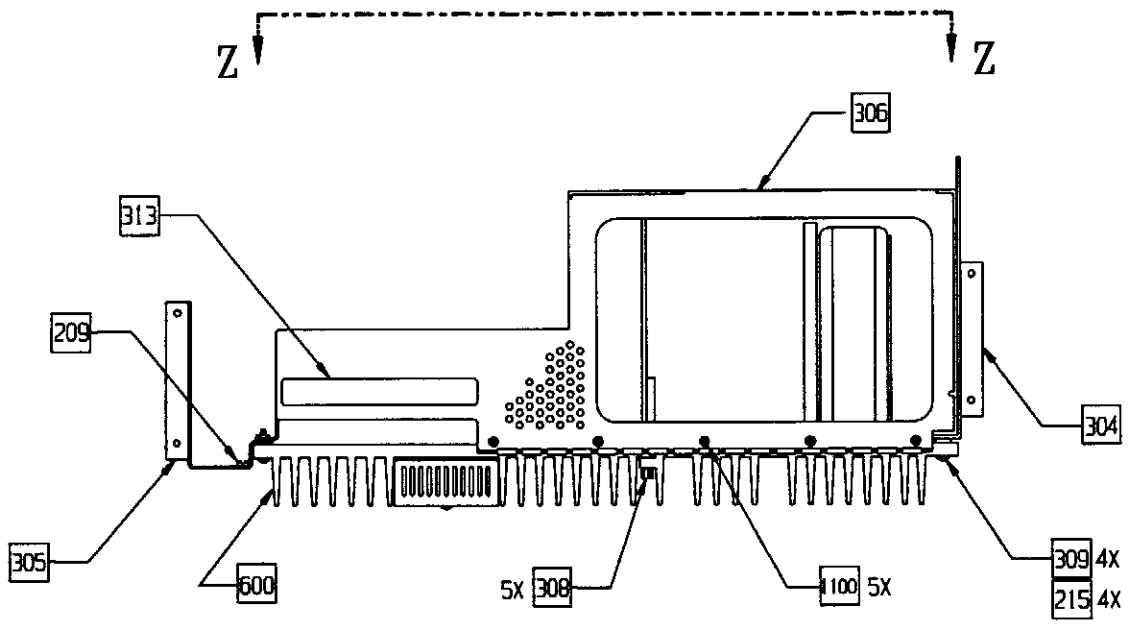
SECTION C-C
ROTATED 90°

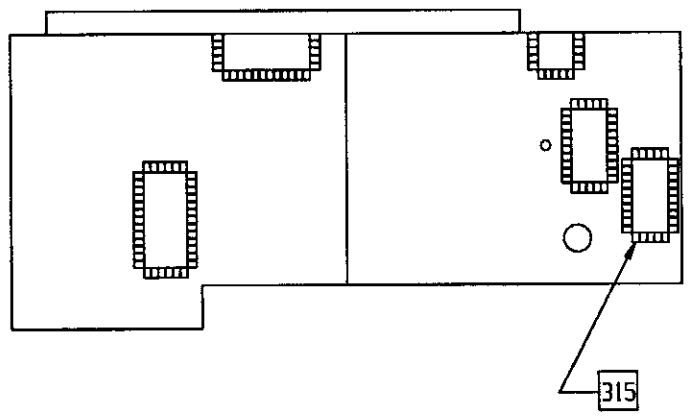


TOP VIEW

Item	Part Number	Description
102	432-0013-02	BASE
104	306618-002	BOTTOM FAN,REMOTE HSG
105	200-0046-00	GUARD,FAN 3.0X3.0,WIRE TYPE
106	384379-001	SPEAKER,RND,2.5IN,8 OHM,.3W
107	407-0049-00	BRACKET,CPU DRAWER RIGHT
108	407-0050-00	BRACKET,CPU DRAWER LEFT
109	306952-001	AIR FILTER,FAN
110	386-0050-01	PLATE,FAN FILTER COVER
112	358302-002	6-32X5/16 SCREW
113	210-0006-00	WSHR,LOCK ,# 6 ,INT,OD.283,.018THK
114	670-0411-01	PCB ASSY,AC SWITCH,NE18,PCMS
115	358263-002	SCREW,PN.HD.CRS.STL
116	358074-001	WASHER, #4 FLAT
117	211-0008-00	SCREW,MAC, 4-40,PAN ,PHPS,STL, .250
118	358074-002	WASHER, LOCK #4
119	214-0136-00	CLIP GROUND CPU DRAWER
121	360004-008	SPACER, NYLON,1/2
122	213-5121-00	SCR,#4X1.25,FLT,PHIL,STEEL,ZINC,100
123	342-0066-00	INSULATOR,BOTTOM,AC SWITCH
125	342-0065-00	INSULATING BARRIER,TOP,AC SWITCH
126	211-0102-00	SCR,2-56,PAN,L.750,STL,PHIL,ZINC PL
127	358702-045	6X3/8PH.FL.HD.SHT.MT
129	306622-001	CBL ASSY CPU/SPEAKER
130	334-0432-00	LABEL,INFO,AIR FILTER REPLACEMENT
132	358053-005	WASHER, LOCK SPLIT#2
133	358072-001	WASHER, FLAT#2
134	361-5049-00	SPACER,NYLON,#4,L.5,.187OD
700	119-0040-03	POWER SUPPLY ASSY (INTERNATIONAL)

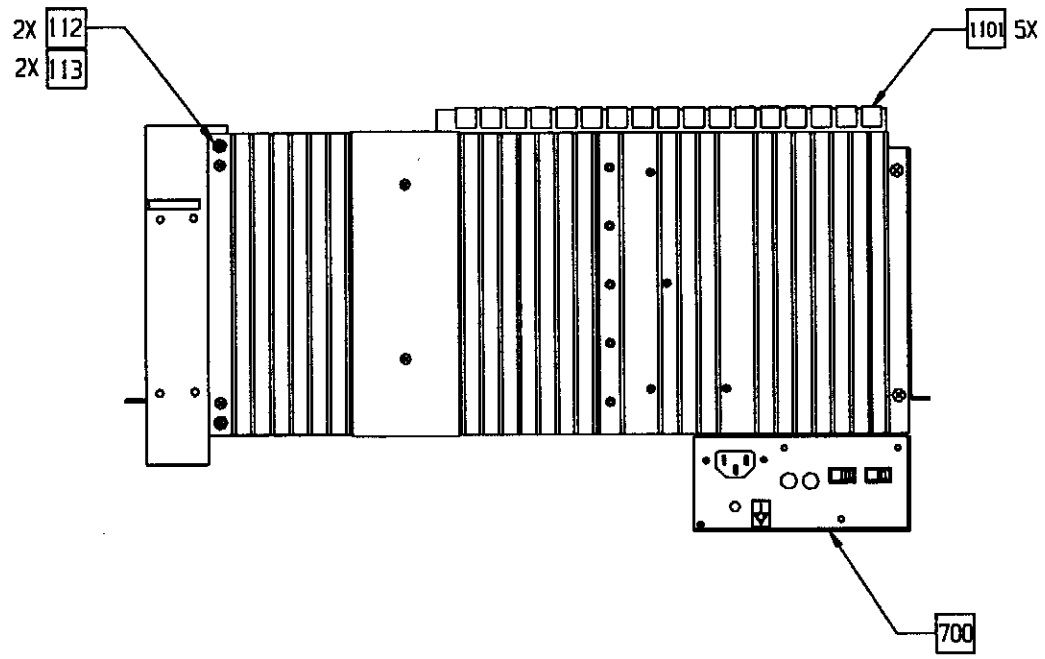
Top Assembly
P/N 650-0196-XX
Sheet 5 of 9

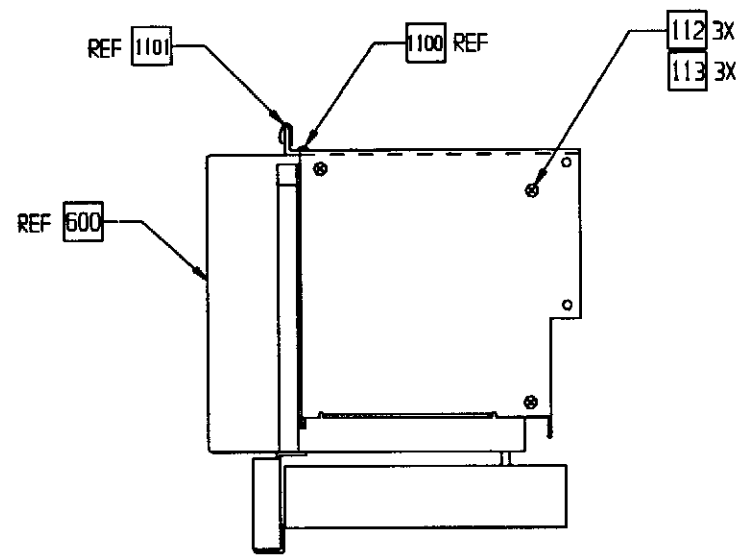




VIEW Z-Z

Item	Part Number	Description
112	356302-002	6-32X5/16 SCREW
113	210-0006-00	WSHR,LOCK ,# 6 ,INT,OD.283,.018THK
209	384273-001	CARD GUIDE DEEP CHL
304	407-0047-00	BRACKET,PWR SPLY RIGHT REAR
305	407-0135-00	BRACKET,DEFLECTION,LEFT REAR
306	441-0052-01	CHASSIS POWER SUPPLY
308	212-0014-00	SCREW,SCKT CAP 8-32X5/8 ST.BLK OX
313	306643-001	LABEL-X-Y-DEFLECT
600	119-0177-01	ASSY,DEFLECTION,PC1
700	119-0040-03	POWER SUPPLY ASSY (INTERNATIONAL)
1100	211-0072-00	SCR,W/WASHER,4-40X.375,PAN,PHIL
1101	348-0166-00	GASKET,CLIP-ON,BECU,COMPRESS

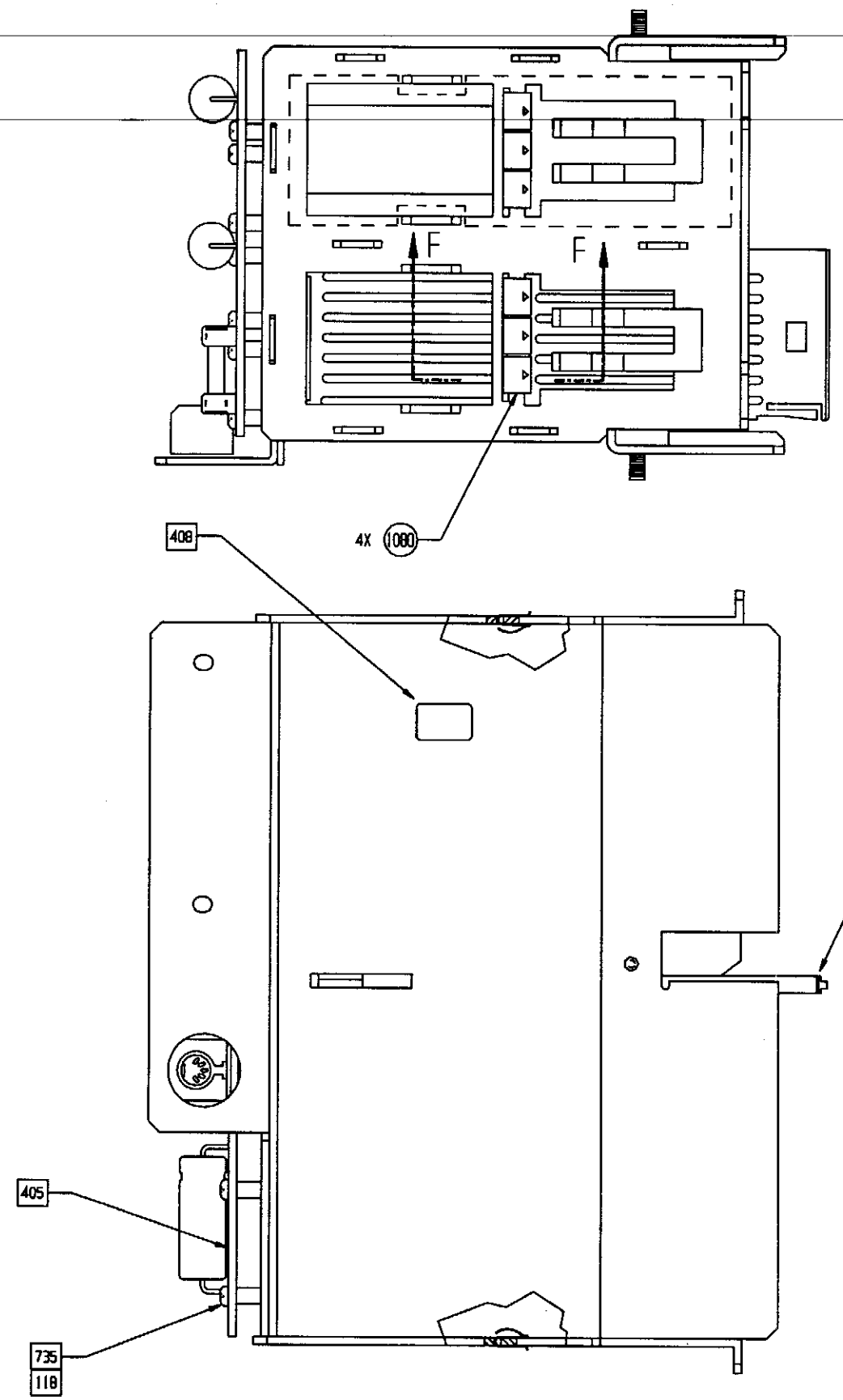


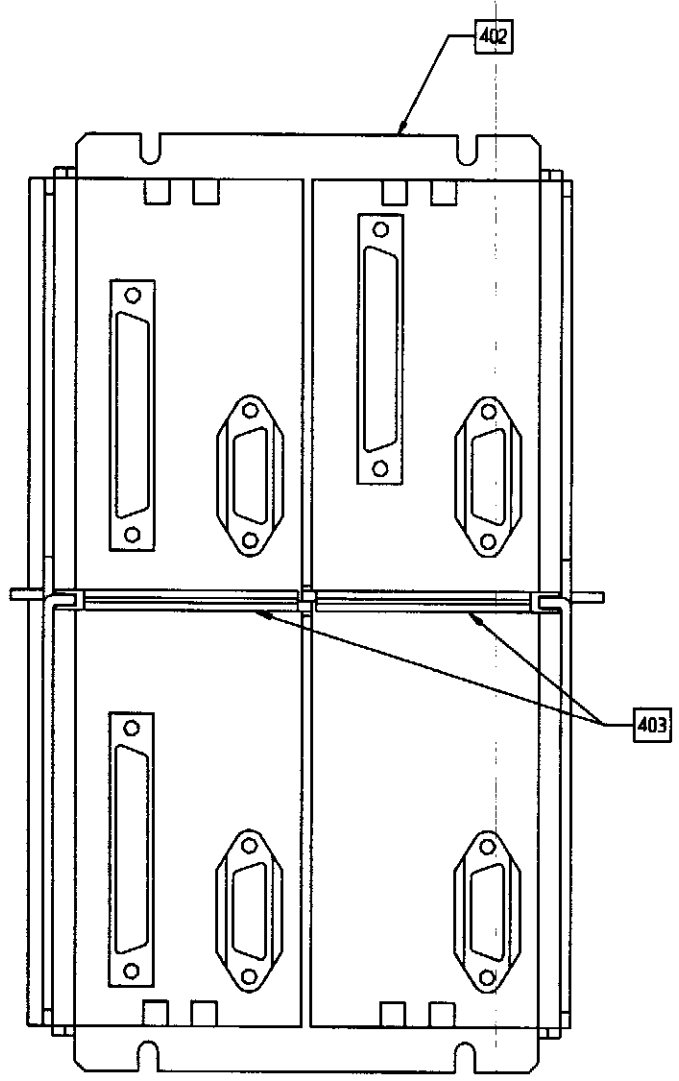


VIEW L-L

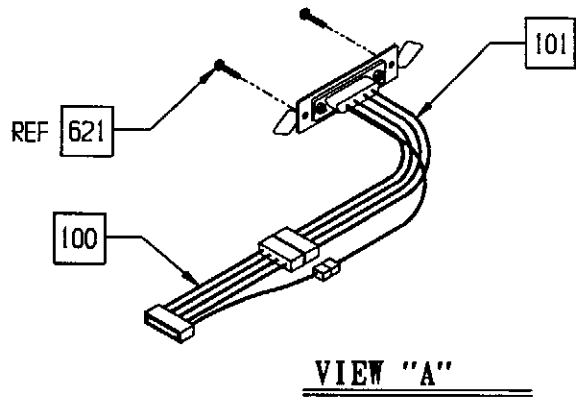
Top Assembly
P/N 650-0196-XX
Sheet 6 of 9

Item	Part Number	Description
118	358074-002	WASHER, LOCK #4
~~402~~	~~426-0020-01~~	~~FRAME,MODULE CAGE,90303B~~
403	426-0034-01	DIVIDER,MODULE CAGE
405	670-0349-01	PCB ASSY,BACKPLANE,PCMS
408	308241-001	LABEL,FUSE RATING,MODULE CAGE
735	358255-002	4-40X1/2PH.PN.HD.ST.
1080	214-0266-00	BERYLLIUM,COPPER FINGERS-CLIP ON APPROX 6" PER UNIT

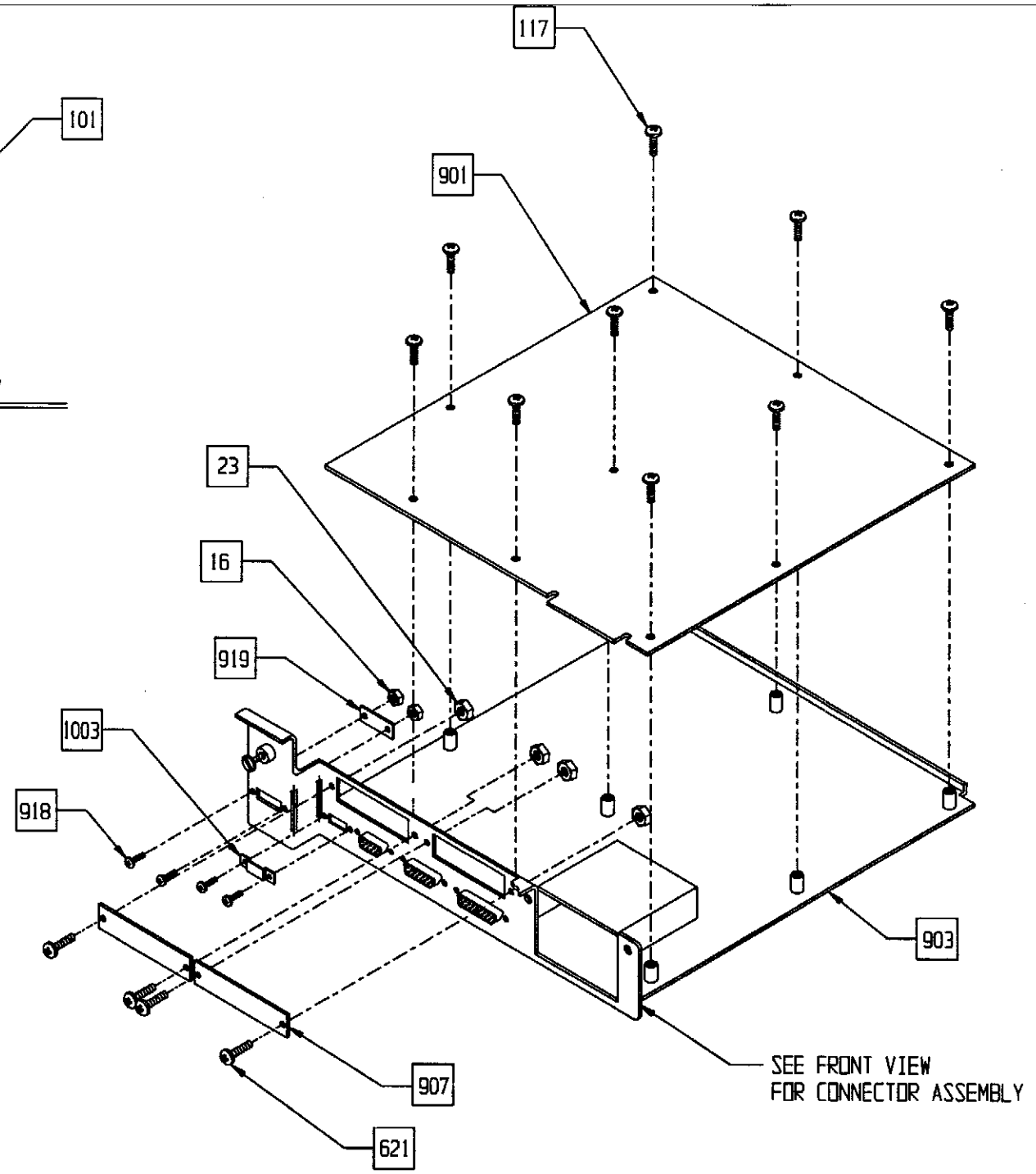


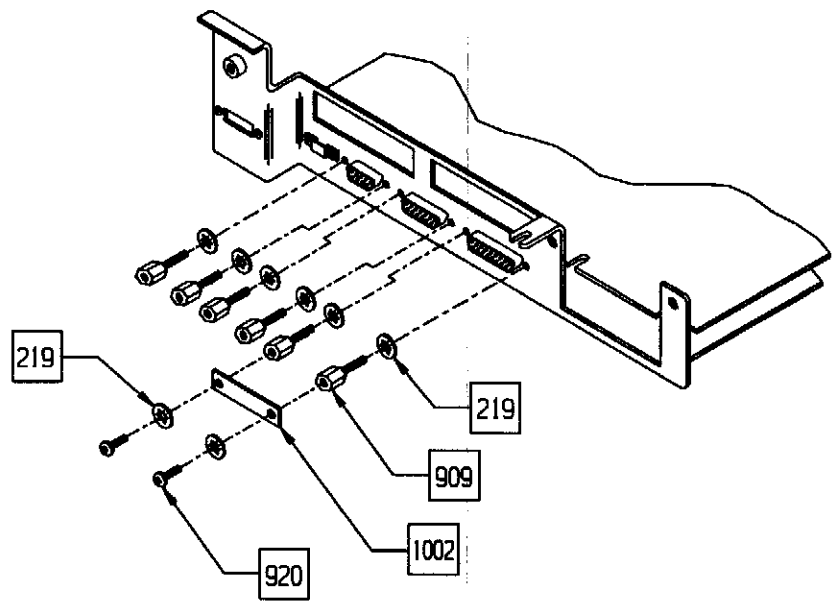


Top Assembly
P/N 650-0196-XX
Sheet 7 of 9



VIEW "A"



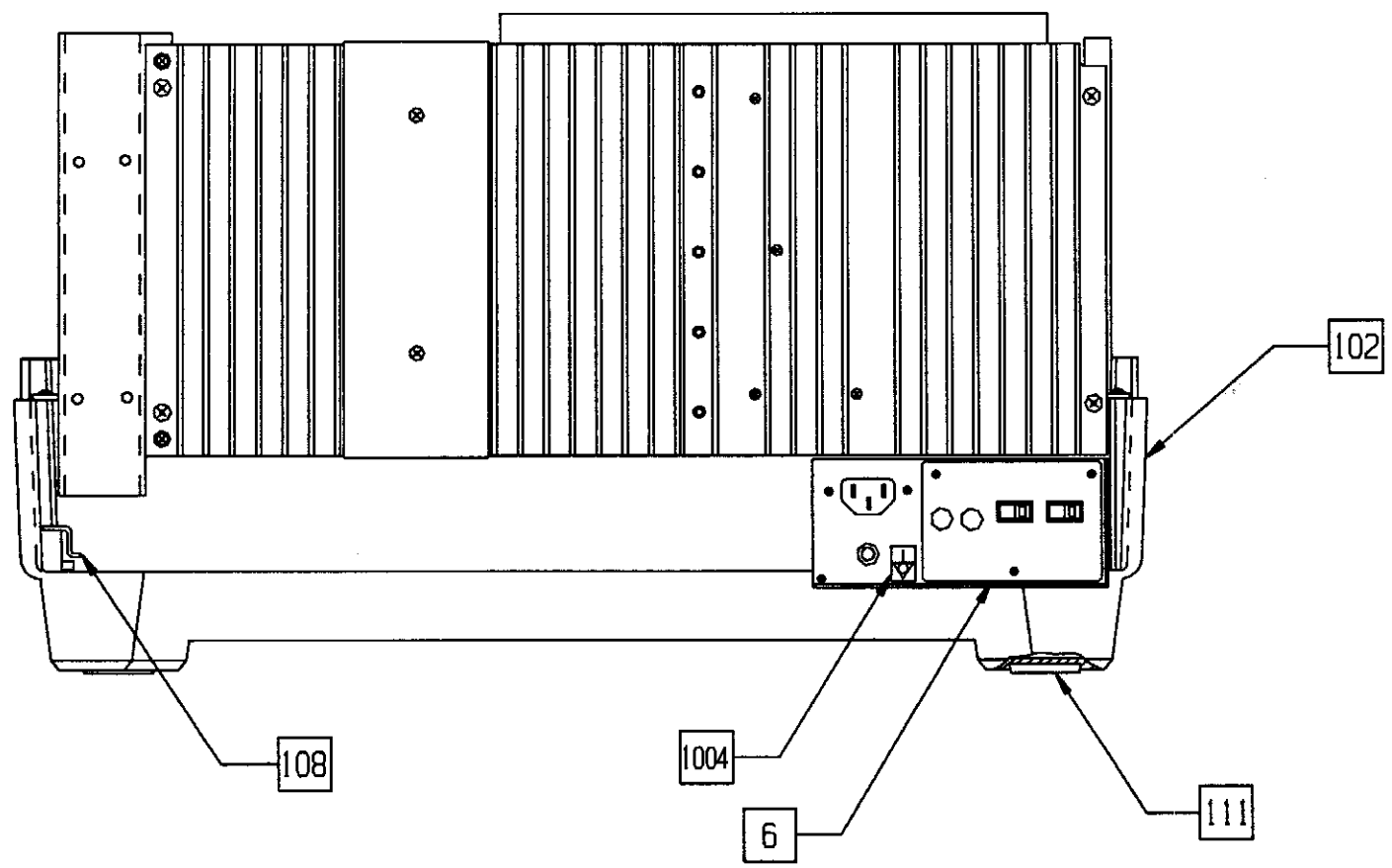


FRONT VIEW

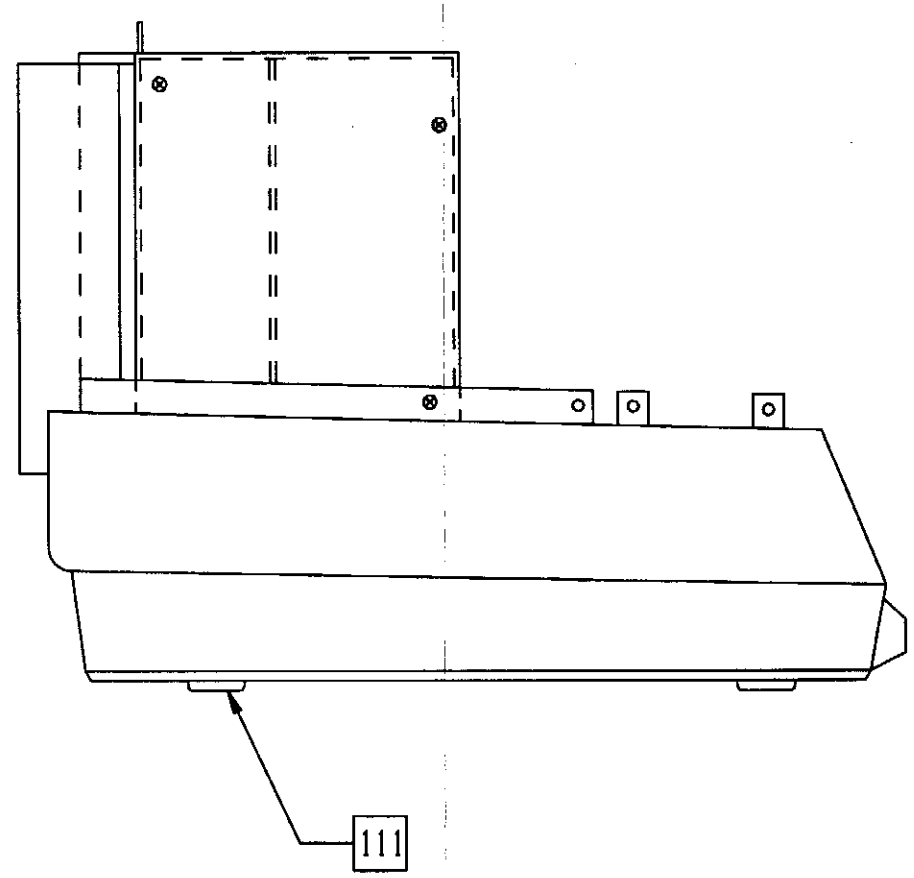
Item	Part Number	Description
23	210-0457-00	NUT, 6-32,KEPS ,STL,.312H
117	211-0008-00	SCREW,MAC, 4-40,PAN ,PHPS,STL, .250
219	210-0004-00	WHSR,LOCK ,# 4 ,INT ,OD.26,.015THK
621	358303-015	6-32X3/8PH.PN.HD.BLK
901	670-0477-03	PCB ASSY,PAULINE CPU
~~903~~	~~436-0004-01~~	~~DRAWER,CPU,90303B~~
907	306958-001	COVER PLATE
909	358778-001	SCREWLOCK FEMALE
918	358251-084	4-40X1/4 PN.HD.BLK
919	200-0069-00	COVER,CONNECTOR,15 PIN DB
920	358250-002	4-40X3/16PH.PN.HD.CA
1002	200-0146-01	COVER,RS232 INTERNATIONAL
1003	200-0145-01	COVER,EXTERNAL ALARM INTERNATIONAL

Top Assembly
P/N 650-0196-XX
Sheet 8 of 9

Item	Part Number	Description
6	337-0071-01	SHIELD
102	432-0013-02	BASE
108	407-0050-00	BRACKET,CPU DRAWER LEFT
111	306946-001	FOOT,SELF ADHESIVE
1004	334-0436-00	LABEL,EQUIPOTENTIALITY,IEC 417-5021



REAR VIEW



RIGHT SIDE VIEW

Top Assembly
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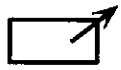
Sheet 9 of 9

Appendix A: Safety Symbols

The following list describes all symbols used on SpaceLabs Medical products. No one product contains every symbol. Refer to this directory for details concerning the symbols used on a particular product.

Description	Symbol	Description	Symbol
ON--power connection to mains		OFF--power disconnection from mains	
ON position for pushbutton power switch		OFF position for pushbutton power switch	
STOP or CANCEL key		CONTINUE key	
ON--for part of the instrument only		OFF--for part of the instrument only	
START/STOP key		START/STOP key	
START key (NIBP)		ON direction	
ON/OFF key		Television; video display	
Protective earth ground		Functional earth ground	
Foot switch		Caution--hazardous voltages. To reduce risk of electric shock, do not remove cover or back. Refer servicing to qualified service personnel (U.S.A.) DANGER--high voltage (International)	
PAUSE or INTERRUPT key		Slow run	

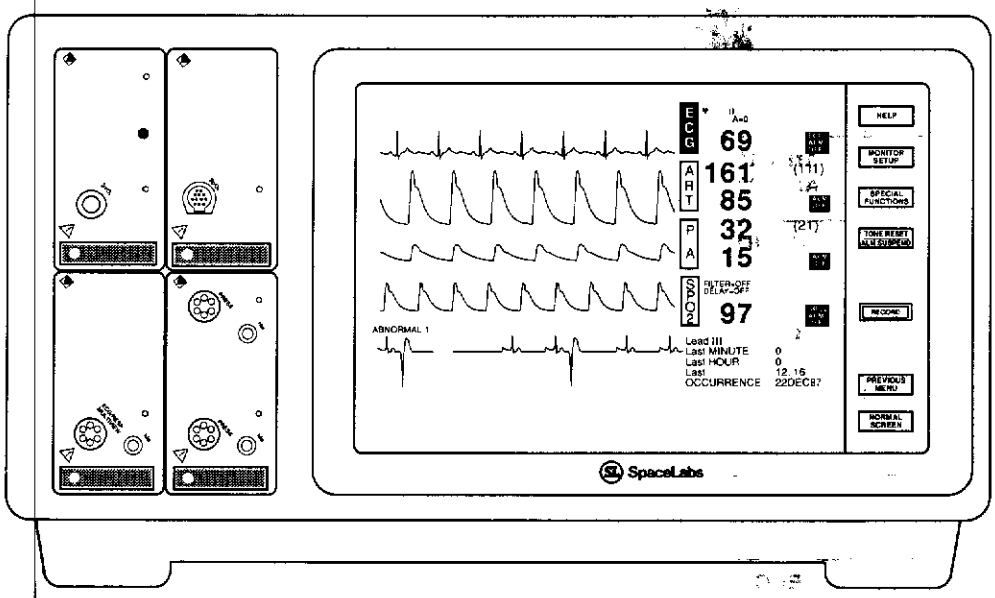
Description	Symbol	Description	Symbol
Replace fuse only as marked		Fuse	
Power supply jack polarity (+/- signs may be reversed)		Equipotentiality terminal	
Both direct and alternating current		Replace only with appropriate battery. Note that +/- signs may be reversed	
Alternating current		Direct current	
Amperes	A	Hertz	Hz
Volts	V	Watts	W
Temporary shut off of alarm tone or screen indicators		Alarm	
ENTER key		Key to print out report	
ATTENTION--consult description elsewhere in this manual		Risk of explosion if used in the presence of flammable anesthetics	
Indicator--remote control		Indicator--local mode	
Return unit to monitor mode		Out of paper indicator	
Activate recorder for graphics		Auto Mode (NIBP)	
Output		Input/Output	

Description	Symbol	Description	Symbol
Data input/output		HELP (explain prior screen) key	
Key to allow clock/time setting		Set initial conditions menu	
A. Monitor setup B. Select program options		Call up Special Function Menu	
Return to Prior Menu		Normal Screen	
Gas Exhaust		TREND/TIMER	
Arterial pulse		Electrocardiograph or defibrillator synchronization	
IEC 601-1 Type BF equipment which is defibrillator proof. The unit displaying this symbol contains an F-type isolated (floating) applied part which contains an adequate degree of protection against shock, and is suitable for use during defibrillation.		IEC 601-1 Type BF equipment. The unit displaying this symbol contains an F-type isolated (floating) patient applied part providing a high degree of protection against shock.	
IEC-601-1 Type CF equipment. The unit displaying this symbol contains an F-type isolated (floating) patient applied part providing a high degree of protection against electric shock and is suitable for use during defibrillation.		IEC 601-1 Type CF equipment. The unit displaying this symbol contains an F-type isolated (floating) applied part providing a high degree of protection against electric shock.	
IEC 601-1 Type B equipment. The unit displaying this symbol contains an adequate degree of protection against electric shock.			
ETL Laboratory approved		Canadian Standards Association approved	

Description	Symbol	Description	Symbol
Arrhythmia 1 Arrhythmia 3	**Arr1** **Arr3**	Non-invasive blood pressure	NIBP nibp
Arrhythmia Net 1 Arrhythmia Net 2	**ArrNet1** **ArrNet2**	Nitrous oxide	N2O
Capnography	**CAPNO** **capno**	Oxygen Saturation	SpO2
Carbon Dioxide	**CO2**	Pressure	PRESS press PRS
Cardiac Output	**C.O.** **CO** **co**	Respiration	RESP resp
Diastolic	**DIA** **dia**	Synchronous data link control	SDLC
Electrocardiogram	**ECG** **ecg**	Systolic	SYS sys
Electrosurgical interference suppression	**ESIS**	Temperature	TEMP temp
End-tidal carbon dioxide	**ETCO2**	Transcutaneous oxygen	TcPO2
External	**EXT**	Transcutaneous carbon dioxide	TcPCO2
High level output	**HLO** **hlo**	Electroencephalogram	EEG eeg
Multi-lead electrocardiogram	**MULTI ECG**		

SpaceLabs Medical

The Clinical Information Company



PC Bedside Monitor 90303B

- **Touchscreen control**
- **Large 12-inch screen**
- **Same human interface as all PCMS™ monitors**
- **Cordless remote keypad available**
- **Easily configured using interchangeable PCMS modules**
- **Easily updated through the external ROM-pack and modular design**
- **Distributed processing architecture**
- **Designed specifically for rapid servicing**
- **Advanced service diagnostics program**

SPECIFICATIONS

Touchscreen – With the exception of power (ON/OFF), all controls are on-screen "touchkeys"; touch is sensed by infrared optical devices.

Waveform Capacity – Five traces standard; 3, 4, and 6 traces optional

Module Capacity – Up to six PCMS modules with four in the 90303 and two in the 90431 or 90415 Module Housing

Parameter Capacity – Up to 11 parameters, including PCMS modules and Flexport® interfaces

Trends – 24 hours of trend data can be displayed in 1, 2, 6, 12, or 24 hour segments. Data is stored in one minute resolution.

Display –

Area:	7.2 in (18.2 cm) high 9.5 in (24.1 cm) wide
Resolution:	560 by 384 pixels
Trace Height:	0.9 in (2.3 cm) dynamic range
Sweep Speed:	A variety of speeds are available under PCMS module control
Type:	Monochromatic, CRT

Program Module – New features and capabilities are easily added through a program module exchange

Connectors – RS232(1), SDLC(1), Ethernet,™ Remote Nurse Alert, and Keyboard*
*Option must be purchased to function with this connector

Options –

-04 Analog Output Board
-05 Dual Serial Board
-06 Terminal Emulation
-07 RS232 Interface
-08 Six Trace
-10 Tabular Trends, Physiological and Drug Dose Calculations
-13 Three Trace
-14 Four Trace
-20 Data Shuttle (uses 90470 module)
-26 Patient Data Logger
-51 Bedside Chart

PC Bedside Monitor 90303B

WARRANTY
SpaceLabs Medical warrants their equipment for 12 months from the date of installation for products requiring installation or 12 months from the date of delivery if installation is not required.

All specifications are subject to change without notice.

SpaceLabs Medical, Inc.
15220 N.E. 40th Street
P.O. Box 97013
Redmond, WA 98073-9713
(206) 882-3700

18M 061 0089 03 08/92

SPECIFICATIONS continued

ELECTRICAL SPECIFICATIONS

Mains Power User File Server System – Line voltage: 110-120 VAC (switchable to 230-240 VAC), Frequency: 50-60 Hz

Fuse Ratings – Two 3A required for 115 VAC or two 1.6A required for 230-240 VAC

Batteries – 1.5Ah lead-acid cell; requires 24 hours to fully charge with monitor active; patient data will be maintained for at least 2 minutes after AC power is lost. A lithium battery (3V, 1.75Ah) provides power for system configuration and has a 5 year life.

Isolation – Chassis leakage current not greater than 100 μAmp (meets AAMI, UL544, CSA 22.2 and IEC 601-1 standards).

PHYSICAL DIMENSIONS

Height:	11.5 in	(29.2 cm)
Depth:	17.0 in	(43.2 cm)
Width:	19.77 in	(50.2 cm)
Weight:	57 lbs	(25.9 kg)

excluding modules

ENVIRONMENTAL REQUIREMENTS

Storage –
Temperature: -40 to 185°F (-40 to 85°C)
Humidity: 10 to 95% (noncondensing)
Altitude: 0 to 40,000 ft (0 to 12,192 m)

Operating –
Temperature: 50 to 104°F (10 to 40°C)
Humidity: 10 to 95% (noncondensing)
Altitude: 0 to 15,000 ft (0 to 4,572 m)

REGULATORY APPROVALS

Meets ETL, GLEM, CSA, BSI, TUV, NATA, JMI, SEV, IEC, AAMI, UL and SEMKO standards for electrical safety